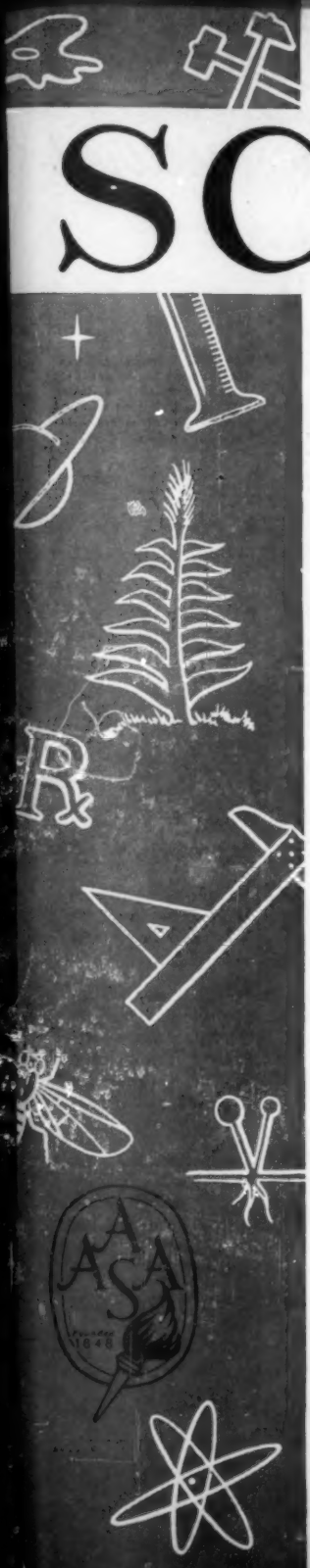

SCIENCE

NOVEMBER 2, 1951

VOLUME 114 NUMBER 2966

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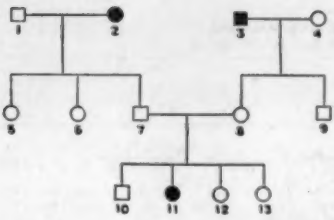

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Catalysis

THE phenomenon of catalysis was discovered well over a century ago and has ever since intrigued the chemist. Even though the manufacture of most industrial chemicals and of practically all petroleum products involves the use of catalysts, elementary textbooks usually dismiss catalysis by defining it as the acceleration of a chemical reaction by a substance which itself does not change significantly.

The Gordon Research Conferences of the AAAS have devoted one week to the elucidation of catalysis every year since 1940. The points brought out in the conference held last June gave reason to expect that some of the mystery surrounding catalysis may soon clear away.

Up to recent years, the catalyst has been considered as an unspecific adsorbent which holds the reactants in a favorable geometric position so as to permit the reaction to occur. Thus the catalyst was pictured as a kind of jig, but insufficient attention was given to the interaction between the catalyst and the reactant.

Papers by H. S. Taylor, Weyl, and Hulburt showed that, according to recent work, notably by Garner, Dowden, and others, the chemisorption and the catalytic activation of the reactants can be correlated with the electron-donating and -accepting properties of the catalyst. On this basis, the catalytic activity of the transition metals for hydrogenation can be ascribed to their partly empty D-shells and their capacity of temporarily accommodating the electrons of the reactants in these shells and of rearranging them to form the new compounds. The same consideration holds also for a large number of oxide catalysts, which are semiconductors because of the presence of lattice defects caused either by impurities or by partial oxidation or reduction. Again, the transfer of electrons between reactants and oxide, and the mobility of the electron within the semiconducting oxide catalysts, are necessary conditions for catalytic action.

According to this concept, the catalyst can be compared to an electronic switchboard in its action, and a good example for this mechanism is the isomerization of hydrocarbons by catalysts containing silica, alumina, and nickel (Ciapetta). In this instance, the carbon skeleton is rearranged by switching carbon—carbon bonds within the individual molecules in a manner similar to the way a train is switched from one track to another.

Papers by Simard, Kirkpatrick, Hofer, Anderson, Selwood, and Eckstrom dealt with the changes that occur in the composition of the catalyst as a consequence of the reaction catalyzed. Some of these, as, for example, color changes of the vanadium pentoxide catalysts used in catalytic oxidation of hydrocarbons, are obvious, whereas others require delicate magnetic, electrical, optical, or x-ray diffraction methods for detection. These changes may lead to the formation of common or unusual compounds, or may result in novel material otherwise not formed. They show distinctly that the catalyst does participate in the reaction it accelerates, and will eventually offer a clue to its mode of action.

Fries and Eischens reported on progress made in catalytic research by the use of isotopic tracers. By this technique it is possible to trace the fate of a given type of molecule, or even a given part of certain molecules, in the bewildering variety of chemical reactions, or to follow the exchange or displacement of labeled molecules on the surface of the catalyst. Further possible application of the radioactive isotopes is the study of the diffusion processes within the solid catalyst.

Besides the significant technical advances made in the field of catalysis, the conference revealed that industrial firms are conscious of the necessity of fundamental research in catalysis and contribute generously to this type of activity. It is to be hoped that industry's share in basic studies will keep on increasing and will bring us closer to the solution of the puzzle.

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SCIENCE, founded in 1880, is published each Friday by the American Association for the Advancement of Science at the Business Press, 10 McGovern Ave., Lancaster, Pa. Entered as second-class matter at the Post Office at Lancaster, Pa., January 13, 1948, under the Act of March 3, 1879. Acceptance for mailing at the special rate postage provided for in the Act of February 28, 1925, embodied in Paragraph (d-2), Section 34.40 P. L. & R. of 1948.

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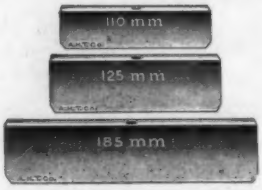

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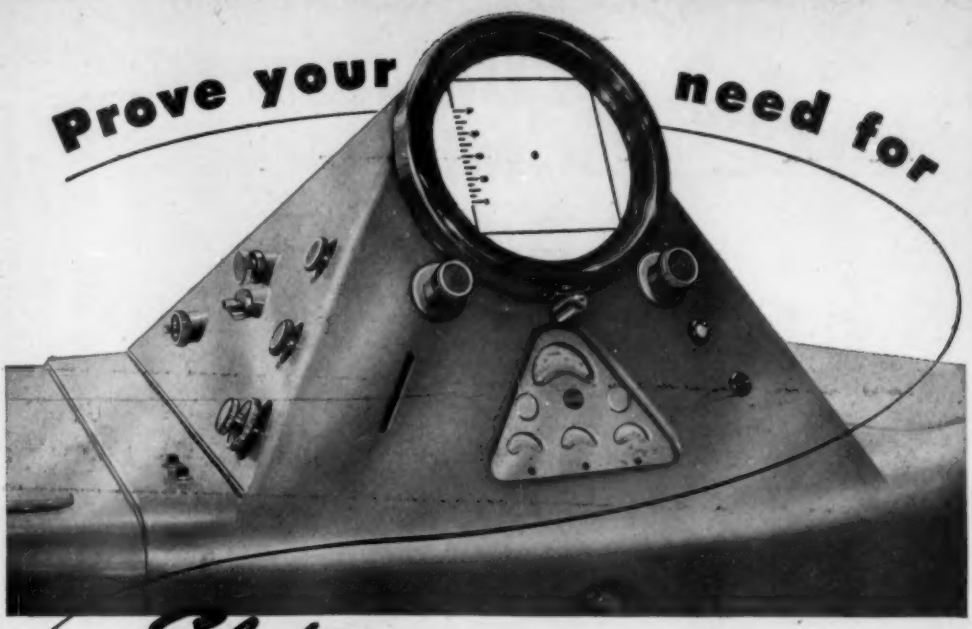

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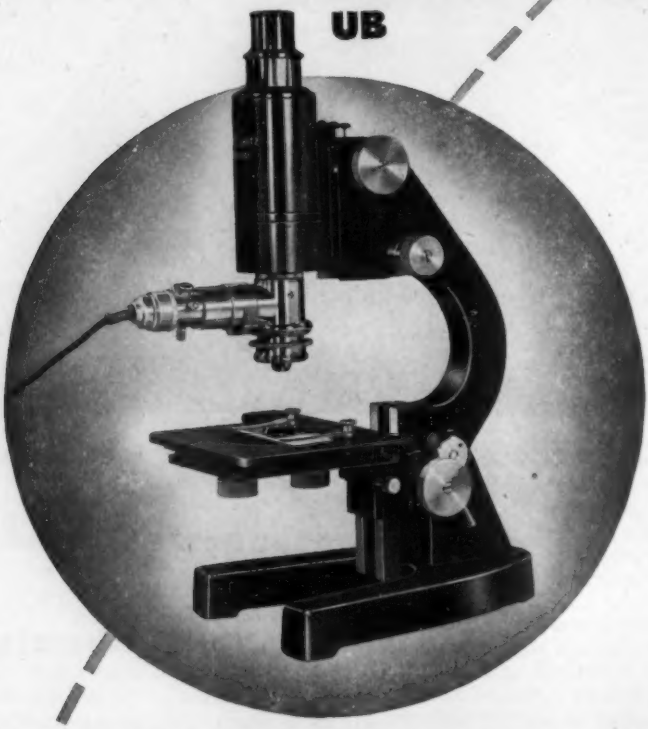

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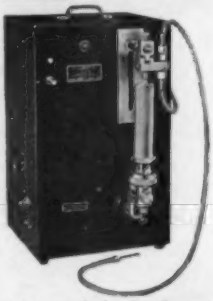

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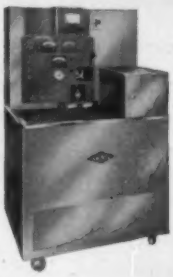

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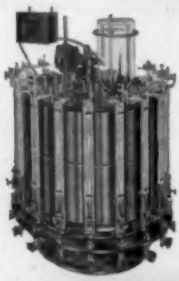

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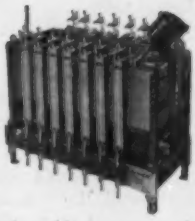

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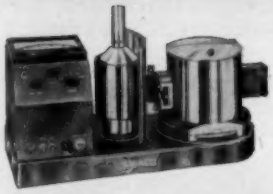

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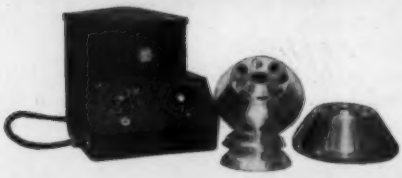

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Federal Recruitment of Junior Engineers[1]

George P. Bush and Lowell H. Hattery
School of Social Sciences and Public Affairs, The American University
Washington, D. C.

ENGINEERING STUDENTS AND THEIR PROFESSORS challenge the personnel policies and procedures of federal agencies. June graduates, furthermore, found better-paying jobs awaiting them in industry than in government. Substantial changes in policy, procedure, and public relations are in order if federal agencies are to be in a favorable competitive position for obtaining young engineering talent.

These conclusions arise out of a study of attitudes of June graduates, deans of engineering schools, engineering professors, and placement officers in engineering colleges. The major purpose of the study was to determine the reason why engineering students did or did not apply for U. S. Civil Service Commission examinations in the fall and spring of 1950–51. High lights of the accumulated data relating to the specific problem, and more generally to engineering student attitudes toward federal employment, are summarized in this article.[2]

Campus visits were made to six engineering colleges in the eastern United States, selected to represent different environmental factors.[3] Students in civil, electrical, and mechanical engineering were asked to fill out questionnaires, and a sample number were interviewed individually. Deans of engineering schools, engineering professors, and placement officers were also interviewed.

The questionnaire. Students were asked to fill out a four-page questionnaire, which was administered in about twenty minutes. The questionnaire asked the student to check classificatory information, and to provide information relative to civil service examinations. Six statements of general attitude toward working in government compared with industry were included, and the students were asked to indicate their degree of agreement or disagreement on a five-place response scale. Finally, five open-end questions were asked relating to the students' opinion concerning advantages and disadvantages of federal and industrial employment in engineering.

Six hundred usable questionnaires were collected from 39.8% of students who were to graduate in June. Responses indicated a conscientious effort to be thoughtful and sincere in their answers.

Interviews. Seventy-six students were interviewed individually in open-end interviews lasting 10–75 minutes, with most interviews lasting about 15 minutes. Immediately following the interview, a written record of pertinent comments was made. As many as 16 different classifiable comments relating to student attitudes toward federal employment were noted in one interview. The average was 7.5 per interview.

Fifteen engineering professors were interviewed, and six others submitted written comments. Three deans of engineering colleges were interviewed, and a fourth submitted written comments. The notes made after each faculty interview were analyzed for attitudinal statements and such statements classified and tabulated.

Since the placement officer is often the focal point of campus recruitment, extensive interviews were held with placement office staffs at each of the six colleges One such interview yielded 31 classifiable attitudinal comments.

Analysis of the data. Most of the data collected were subject to statistical tabulation and analysis. Responses to open-end questions and interview comments were classified and tabulated by an inductively developed classification scheme of 88 categories. To facilitate analysis these categories were grouped into several areas of personnel administration to which they were related: recruitment and selection, position classification and pay, placement, training, management-worker relationships, separation and retirement, and miscellaneous.

Examination of interrelationships of data collected by student questionnaire and by student, faculty, and placement officer interview revealed no substantial conflicting testimony but a number of interesting variations in emphasis.[4]

[1] This article is based on the full report of a study conducted by The American University and supported by funds from the Manpower Branch, Human Resources Division, Office of Naval Research. George P. Bush was principal investigator and chairman of a university committee for the project, composed of Catheryn Seckler-Hudson, Lowell H. Hattery, Charles M. Hersh, and Robert T. Bower. An advisory committee of federal officials contributed to the planning of the study. The advisory committee was composed of Milton M. Mandell, U. S. Civil Service Commission, *chairman*; Ralph M. Hogan, Office of Naval Research; D. R. Hicks, Bureau of Reclamation; Charles W. Fotis and Lionel Murphy, Air Research and Development Command Headquarters; Raymond Randall and George Porter, National Bureau of Standards; William T. Pecora, U. S. Geological Survey; and Henry A. Sawchuck, U. S. Civil Service Commission.

[2] For a full report of findings, see G. P. Bush, *Engineering Students and Federal Employment*. Washington, D. C.: Am. Univ. (1951). Available on loan from R. M. Hogan, Manpower Branch, Human Resources Division, Office of Naval Research, Washington 25, D. C.

[3] College of the City of New York, Cornell University, Drexel Institute of Technology, North Carolina College of Agriculture and Engineering, Rensselaer Polytechnic Institute, and West Virgina University.

[4] Complete classification system and tabulations of the data are presented in the full report of the study.

Students Favor Industrial Work

In their agreement-disagreement response to six statements comparing government and industrial work, students showed a generally unfavorable attitude toward government. For example, students were asked to indicate their agreement or disagreement with the following statement:

> I would have greater opportunity for professional growth and development in government than in industry in my field.

Students were asked to check one of five degrees of agreement: strongly agree, tend to agree, neither agree nor disagree, tend to disagree, or strongly disagree. Of those who indicated strong agreement or disagreement, 13 strongly agreed and 202 strongly disagreed. Students felt, even more strongly, that the opportunity for *financial return* from a career in government was less favorable than from a career in industry. Four felt strongly that the *prestige* of government employment was higher than for industrial employment, whereas 194 felt strongly that prestige of government is less than industrial employment. Unfavorable attitudes toward government employment compared with industrial employment, though less strong, were nevertheless marked with respect to the *interesting nature of the work, contribution to engineering field,* and *training received.* Totals of responses to the six statements, which were composed in a form favorable to government employment over industrial employment were:

Strongly agree	71
Tend to agree	362
Neither agree nor disagree	773
Tend to disagree	1,382
Strongly disagree	974

Seventy-two students who had previous government employment experience showed little variation in their attitudes from those of the total group, though they were more favorable toward the interesting nature of the work in government, but less favorable toward government employment in terms of prestige.

Advantages and Disadvantages of Federal Employment

Students were queried both by questionnaire and by interview about their opinions concerning the advantages and disadvantages of federal and industrial employment. It was obvious in some cases that the student's opinion was not supported by fact; nevertheless, his opinion, even though specious, may be effective in his motivation.

Recruitment factors. Students mentioned *job security* as a factor favorable to government employment more often than any other. Job security was listed as an advantage by 336 students; job insecurity was listed as a disadvantage of industrial employment by 257 students. Fifty-six students, however, considered job insecurity a disadvantage of government, and 39 students considered job security an advantage of private industry.

Surprising to the investigators, in view of the federal civil service system, was the degree to which *political influence* was considered a disadvantage of federal employment. Eighty-four students referred to political influence as a disadvantage of federal employment with such remarks as: "There are too many political connections necessary . . . it's not what you know but who you know—in spite of apparent merit systems," "The top jobs are obtained through political influence," and "In the civil service you frequently reach a point where some politicians cross you up."

Location of the job, because of uncertainty or undesirability of location, was an unfavorable factor for federal employment. One student commented, "Federal employment would most likely take me from my desired working area; place me at some undesirable location. . . ." Another said, "It's virtually impossible to move and find housing when you have children."

There was indication that the students believe there is greater *variety of engineering jobs* in industry. Sixty-six students listed this factor as an advantage of industry, 16 listed lack of variety in kinds of jobs as a disadvantage of government. On the other hand, 32 students considered variety of positions an advantage of federal employment.

Pay. Throughout the study, *higher starting pay* and *higher pay in higher grades* were preponderant disadvantages of government and advantages of private employment. One student said simply, "Industrial offers of more money just can't be overlooked." That the pay differential is an actual deterrent to accepting federal employment was admitted by students in such comments as: "I would like to work for civil service, but the difference of $500–$800 in pay is too much;" and "I would have given much more consideration to the Naval research program had the starting salary been a little higher." More than half the students who filled out questionnaires cited pay as a disadvantage of federal employment.

Promotion. The government fared little better in the matter of promotion, which is, of course, related to pay. Only five students listed *promotion by merit* as an advantage of federal employment, contrasted with 96 students who considered the lack of it a disadvantage, and 117 who considered it an advantage of private employment. Some typical comments concerning federal promotion were: "Have lived most of life in D. C. . . . Have seen too many capable men stuck, half way up," "You have to wait for someone to die to get ahead in civil service," "The ambitious cannot rise in the civil service due to politics." The dean of an engineering school commented: "My son graduated from N. In a year he has had three jobs, each better than the last. How can a young man do this in government? If it can be done, then we on the outside are not told and hence presume that a person is stuck in his job once in."

Training. Training opportunities, through both formal training programs and experience, were rated

about even between federal and private employment. Most students who mentioned opportunities, funds, and facilities for research cited them as advantages of federal employment. This indicates that federal agencies engaged in research are in a more favorable position for recruiting engineering talent than other federal agencies. One student pointed out that, in his opinion, "government work is good only for research and development for engineers."

Unfavorable to government is the conception among a number of students that industry has regular training programs for junior engineers, whereas government does not.

Management and Working Conditions

Federal employment showed up well in student comments on *welfare* phases of working conditions, such as annual leave, sick leave, retirement provisions, short working hours, less pressure on employees, better equipment. For example, 168 commented on annual leave provisions as an advantage of government employment.

On the other hand, the tradition of red tape in government was strong among the students, 171 of whom cited *inefficiency of management* as a disadvantage of federal employment, whereas 124 cited efficiency of management as an advantage of private employment. Some typical comments about government management are: "Decisions can't be made and put through in a fast, efficient manner," "In my estimation the government has a reputation for . . . having incompetent supervisors," "I am not attracted to government service because of the seeming maze of red tape."

Several categories of student comments seemed to relate to *morale*. These included references to incentives, independence, restrictions and regimentation, prestige. Federal employment showed up unfavorably in this area, with a net of 139 citations of disadvantages in federal employment and a net of 140 citations favorable to private employment. Some comments: "Classmates look with scorn on anyone even considering government employment," "Federal employment does not stimulate initiative," "In general, individuality seems to be lost in government service."

Private enterprise. Student comments in interviews generally paralleled attitudes expressed in questionnaires. There was, however, distinctly greater emphasis on the issue of private enterprise versus government enterprise. The following remarks, taken from the interviewer's notes, are descriptive of attitudes expressed. "They [government jobs] do not interest me, because I am convinced that there are too many on government payrolls, and the free enterprise system may break down." "I don't believe in government jobs." "There is no background of civil service in my family, and I was headed for industry since I first came here." Student and faculty interviews suggest that children of parents employed in industry tend to prefer employment in industry and children of parents employed in government tend to prefer employment in government.

Faculty Attitudes

On the assumption that professors may influence students' attitudes and employment preferences, extensive interviews were held with faculty members at each of the engineering colleges, and several professors filled out a schedule listing advantages and disadvantages of federal and industrial employment.

Engineering deans and professors reflected a configuration of attitudes similar to that of their students. One departmental chairman, when asked to enumerate advantages of federal employment for a young electrical engineer, answered after some thought, "None." Engineering faculty stressed lower pay, lack of promotion by merit, and adverse morale factors as disadvantageous to federal employment.

Constructive suggestions were offered in several areas. More favorable *publicity* and *public relations* by federal agencies were stressed. Establishment of a *tradition* of going into public service was considered important to successful recruitment. And, of course, a competitive pay schedule was deemed essential. Although the majority of engineering faculty members were less favorably disposed to federal than to industrial employment for junior engineers, there was substantial evidence of conscientious attempts to bring federal employment opportunities to the attention of engineering students. One professor said, "I try to sell government service to my students."

Federal Recruitment Relations

Engineering deans and placement officers were frankly critical but sincerely constructive in discussing experience with direct recruitment by federal agency representatives. The apparent failure of government recruiters to recognize the autonomy of the school is the occasion for criticism on the part of several placement officers. Placement officers complained of (1) the manner of dealing with the college as though it were a land-grant college and (2) the fact that, having been given a scheduled time for interviews, government recruiters frequently arrived late or failed to appear.[5] In contrast, the recruiter from private industry first asked permission to visit the campus at the convenience of the college, and then meticulously met his interview schedule.

Another complaint against government recruiters is their inability to make a good personal impression either on the students or on the placement officers, through lack of knowledge of jobs for which they are recruiting, and lack of technical background in the field. As one placement officer expressed it: "Too many government recruiters are 'nice fellows' but spend too much time explaining 'sick leave' and don't

[5] From interview notes: "Both the placement officer and the students took on a decided anti-government stand when a government interview team from ——— failed to show up for scheduled interviews. This affected all 'government' not just ———."

know professional engineering." In contrast, one placement officer cited an instance in which the industry recruiter "is unusually tactful in his dealings with the placement office. He knows his company; he knows the way the placement office operates; he asks specifically for what he wants; and he gets the men. On occasion he will bring along a specialist from a particular plant."

Only two instances were cited as favorable to government recruiters. One military establishment "sent a four-man team composed of a personnel specialist, a civil engineering supervisor, a mechanical engineering supervisor, and an electrical engineering supervisor. The personnel man interviewed first on personnel matters, and the subject matter interview followed. This seemed an excellent procedure to the placement officers."

Placement officers of all the schools were impressed with the lack of organization of government recruiters after their arrival on the campus. Their interviews were not well planned. They demanded interview schedules on short notice, and no definite jobs were offered. In one instance, on request of a federal agency, 350 students with the help of the placement officer filled out Civil Service Commission Form No. 57 for summer employment and delivered the completed forms to the government installation in person. Up to the time of interview no student had received an offer of employment. Apparently the agency had retrenched in its summer employment policy.

A particularly bad impression was made upon placement officers by one team of federal recruiters. A placement officer reported, "One [recruiter] was cocky, the other three pleasant to deal with. They wanted to interview students on very short notice. . . . Evidently they were not experienced with campus contacts." In contrast, one company in private industry sent the company plane to the campus, picked up four interviewees and a member of the placement office staff and flew them to the home office and back: "All interviewees are signing up."

Appeal of Civil Service Announcements

Of 339 students who saw the announcement of the U. S. Civil Service Commission examination for junior scientists and engineers dated October 1950,[6] 41 students took the examination. Thirty-nine students had been notified they were on the register as having passed the examination.

Competitive Recruitment: A Frame of Reference

There is a shortage of junior engineers, and competition exists for the available supply, especially for those of greatest talent and ability. The federal government has a large demand for junior engineers to man its numerous projects. Some of them can be run of the mine, but others must possess outstanding talent and ability. Industry also needs engineers. The armed forces need engineers for military service. Industry assiduously combs the campus for recruits, and the federal government through its announcements and recruiters attempts to get its share of the graduates.

In this milieu we find the student subject to three principal recruiting systems: the military services, industry, and the federal government. There are other avenues into which the student may go, such as continued education, teaching, state or municipal government. The student choice is affected by the relative advantages and disadvantages, either real or fancied, of available employment. The study indicates certain attitudinal factors which seem to deter students from entering federal employment, and which decrease the effectiveness of government recruitment.

Some of the adverse factors, such as lack of prestige in federal employment, can be changed only slowly. Political influence as a deterrent may or may not be amenable to correction. Other factors could readily be changed once their importance is properly appreciated. The study indicates deficiencies in the policies, organization, and methods of federal recruitment, many of which could be substantially improved. Some adverse attitudes toward federal employment for engineers are based on at least partial misconceptions. This indicates the need for a better flow of information about federal employment opportunities to engineering faculties and students.

So far as junior engineers are concerned, the government is in an adverse competitive position. "Security" and "benefits" in federal employment are important, but there are many other factors that tend to offset or cancel out these familiar standbys.

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[6] U. S. Civil Service Commission Announcement No. 250, dated October 17, 1950.

[7] For an indexed bibliography see the full report of the study.

Technical Papers

Determination of Vitamin B_{12} with a Mutant Strain of *Escherichia coli*

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The determination of vitamin B_{12} activity in various natural materials has generally been accomplished by the use of microbiological assays, employing lactic acid bacteria (*1, 2*) or green flagellates (*3–5*). The complex growth requirements and lack of specificity of response in some B_{12}-utilizing microorganisms have made assays with them difficult (*6, 7*) or unreliable, and the precise determinations that can be obtained with *Euglena* require about 7 days for the period of incubation. In our studies on the binding of vitamin B_{12} to various natural materials, it seemed desirable to develop a new method of assay using a mutant strain of *E. coli*. Essential information concerning the assay is reported briefly here.

The mutant strains of bacteria were obtained from Bernard D. Davis (*8*), who produced them by selection from ultraviolet-irradiated cultures of *E. coli* W (ATCC 9637). One strain, 113-3, showed marked responses to both methionine and vitamin B_{12}, whereas another strain, 26-18, was stimulated by methionine or homocystine but not by vitamin B_{12}. The strain 113-3 was employed in establishing dosage-response curves for different levels of the vitamin and for methionine. It was found that the great sensitivity of the organism to relatively low concentrations of vitamin B_{12} as compared with the requirement for much higher amounts of methionine permitted the development of specific vitamin B_{12} assays of many natural materials by appropriate dilution of samples. Proof of the response of strain 113-3 to vitamin B_{12} in complex materials was obtained by making parallel determinations at different levels for the vitamin with strain 113-3 and for methionine with strain 26-18. The possibility of using strain 113-3 for specific assay of vitamin B_{12} was pointed out in the paper of Davis and Mingioli (*8*), who observed that growth of these bacteria in the absence of the vitamin could not be satisfied by a variety of compounds, including certain amino acids, vitamins, purines, pyrimidines, ribonucleosides and ribonucleotides, thymidine, and intermediates of the B_{12} molecule.

The basal medium which we have used is modified after the formula employed by Davis and Mingioli, with the addition of organic sources of nitrogen in accordance with results obtained in tests made with supplements of single amino acids. The composition of the assay medium made double strength is as follows: H_2O, 500 ml; K_2HPO_4, 7.0 g; KH_2PO_4, 3.0 g; Na_3 citrate $\cdot 3H_2O$, 0.5 g; $MgSO_4 \cdot 7H_2O$, 0.1 g; $(NH_4)_2SO_4 \cdot 1.0$ g; dextrose, 10.0 g; asparagin, 4.0 g; arginine, 100 mg; glutamic acid, 100 mg; glycine, 100 mg; histidine, 100 mg; proline, 100 mg; tryptophan, 100 mg; and sodium thioglycollate, 100 mg. The amino acids were added to the medium in order to obtain maximum growth. Incorporation of thioglycollate appears to protect vitamin B_{12} from destruction in the presence of natural substances during autoclaving (*2, 7*). The pH was adjusted to 6.8. Two and one-half ml of the double-strength medium was added to each tube containing a solution of the standard or unknown sample and sufficient water to make a total volume of 5 ml. The tubes were plugged with cotton and sterilized by autoclaving for 5 min at about 115° C. Following rapid cooling in cold water, each tube was inoculated with a drop of freshly prepared suspension of *E. coli* strain 113-3. Stock cultures of the assay bacteria were carried on Difco nutrient agar. The inoculum was grown in Difco nutrient broth for about 10 hr at 37° C prior to use, and the bacteria were prepared by washing, centrifuging, and resuspending in saline in the usual fashion.

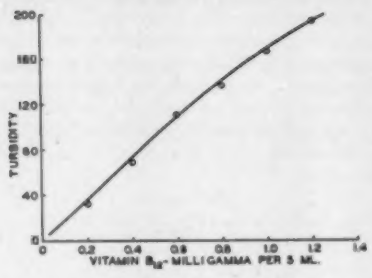

FIG. 1. Dosage response curve of a mutant strain of *E. coli* in relation to different levels of vitamin B_{12}.

It was found that adequate growth could be obtained after 15–18 hr of incubation on a shaking machine with the temperature at 30° C. Doubtless certain other conditions would also be found satisfactory. Growth was estimated with a Klett colorimeter.

A typical dosage response curve is shown in Fig. 1. The half-maximum level of growth occurs at about .12 mγ of B_{12}/ml. Under the specified conditions of assay, the organism responds in similar fashion to vitamins B_{12} and B_{12a} (*9*).[1, 2] Determinations of Vitamin B_{12} activity in various natural materials were accomplished satisfactorily when the ratio of methionine to vitamin B_{12} was such as to permit avoiding methionine activity by simple dilutions. In duplicated assays with *Euglena* and with *E. coli*, blood serum proteins, animal tissue extracts, and various preparations of bacteria and algae yielded satisfactory results. Whole

[1] Supplied by Merck & Co., Inc., Rahway, N. J.

[2] The half-maximum growth in response to methionine occurs at a level of 6 γ/ml, or about 50,000 times the development of B_{12} required to produce an equivalent amount of growth.

normal blood appeared to have amounts of vitamin B_{12} too low to permit direct assay in the presence of free methionine, and for such materials the *Euglena* assay is recommended. It was found necessary to release bound vitamin B_{12} from tissues, blood serum, etc., by heat or enzyme treatments prior to performing the assays (*4, 10*). In situations where methionine interference can be avoided, as in the determination of potency of vitamin concentrates, etc., this bacterial method may have considerable value because of its simplicity and the short time required for making the determinations.

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The Reversible Depolymerization of Fibrin

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In a previous article the author has shown that a gel formed by the action of thrombin upon purified fibrinogen can be dissolved in 6 *M* urea or 3 *M* guanidine hydrochloride to give a product of the same molecular weight as native fibrinogen under the same circumstances (*1*). A similar result has been obtained by Ferry and Shulman and by Mihalyi (*2, 3*).

Upon dialyzing off the urea against buffer, a gel is regained. It was thought desirable to ascertain whether the fine structure of the gel so produced was equivalent to that of a native fibrin gel. Electron microscopy was employed for this purpose.

A novel technique was utilized for preparing the specimens. A drop of Formvar was spread upon a thin trough of water and the resultant thin film scooped off upon a glass microscope slide. A drop of fibrin in 6 *M* urea was spread evenly over the film, and the latter refloated upon borate buffer-KCl of pH 8.0 and ionic strength .40. The urea quickly dialyzed through the Formvar film, and the gel reformed. The film plus a thin layer of gel was deposited upon wire mesh screens in the usual manner.

The specimen was then dried, washed, and shadowed with gold. The microphotographs obtained under these conditions showed a general resemblance to the published pictures of native fibrin gels under the same conditions (*4*). A network of strands was clearly formed, as is shown in Fig. 1.

[1] The author wishes to acknowledge helpful discussions with K. Laki and George Rozsa, of the National Institutes of Health.

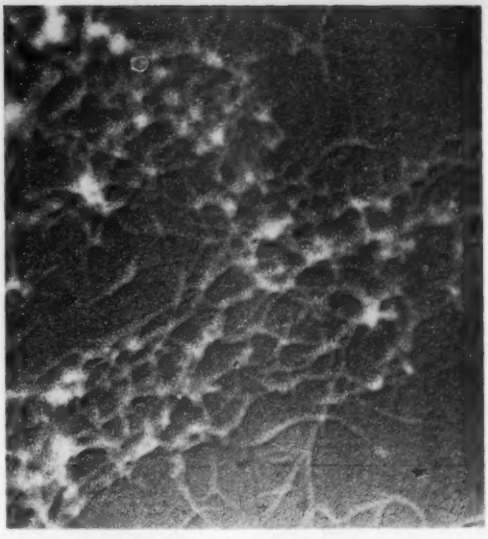

Fig. 1. Gold-shadowed regenerated fibrin clot, pH 8.0, P = .40. × 12,000.

In this manner further evidence is obtained as to the reversibility of the breakdown of fibrin in 6 *M* urea. The depolymerized material is capable of spontaneously reforming a network upon removal of the dispersing agent. It is to this depolymerized material that we may perhaps give the title "profibrin" (*5, 6*).

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The Wave-Frequency Dependence of the Duration of Radar-Type Echoes from Meteor Trails

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A brief discussion of the dependence of the duration of meteor echoes on wave frequency has been given by Lovell (*1, 2*), who concludes that the evidence shows that the duration is approximately proportional to the square of the wavelength. Data collected by the Central Radio Propagation Laboratory of the National Bureau of Standards, consisting of simultaneous measurements of duration at 27.2 Mc and 41.0 Mc, lend support to this conclusion, and in view of its fundamental importance to the theory of

meteoric echoes we feel that the evidence should be presented in some detail.

A long series of simultaneous records of meteor echoes at 27.2 Mc and 41.0 Mc was obtained between November 1, 1948, and October 1, 1949. The peak radiated power (approximately 8 kw), pulse width (approximately 40 μsec), antenna pattern (that of a horizontal half-wave dipole one-quarter wave above-ground), and receiver-recorder sensitivity (approximately 5 μv at the input of the receiver) were approximately the same at both frequencies and were kept as nearly constant as possible throughout the period over which the measurements were made. The work was done at the NBS radio field station at Sterling, Va., about 30 miles west of Washington, D. C.

Two methods of recording the echoes were used. One method employed recording milliammeters; the other, conventional range-time photographic recording. On the first type of record, which was used primarily for obtaining meteor rates, time resolution was insufficient for measurement of durations less than about 15 sec. Time resolution on the range-time record was sufficient for measurement of durations as short as 0.5 sec. The second method was used only during June 1949. The series was interrupted during the Geminid shower in December 1948, the delta-Aquarid shower in July 1949, and the Perseid shower in August 1949, when the equipment was used for other observations.

In Fig. 1 the duration at 41.0 Mc is plotted against the duration at 27.2 Mc for approximately 150 different meteors. Points corresponding to durations less than about 15 sec at either frequency were nearly all obtained from range-time records, and the remainder were nearly all obtained from the milliammeter tapes. A straight line of unit slope was fitted visually to the points. It corresponds to a ratio of 27.2 Mc to 41.0 Mc durations of almost exactly 2:1.

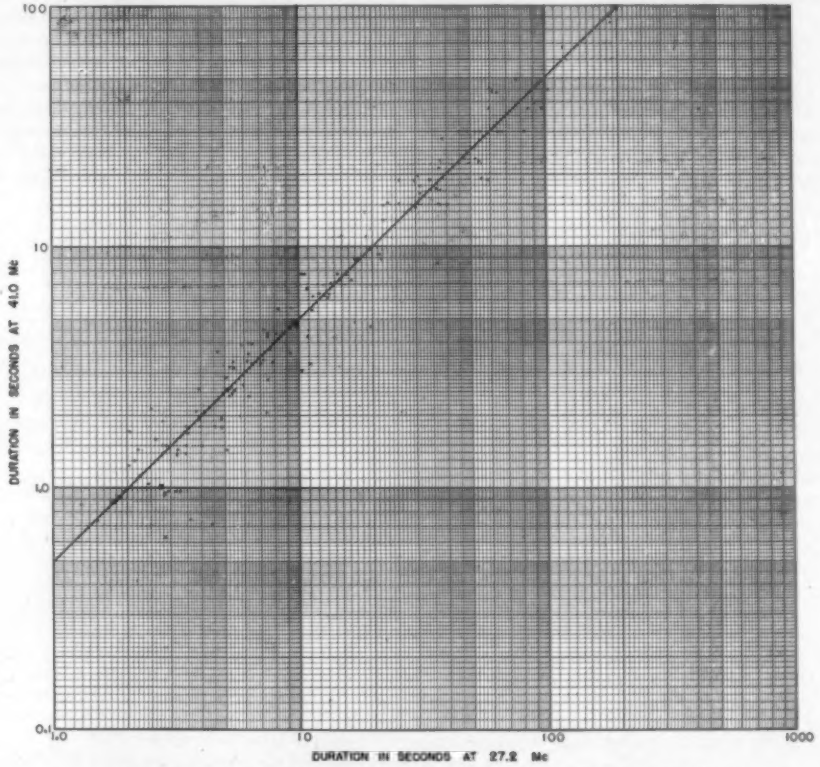

FIG. 1. Duration of meteor reflections at 41.0 Mc vs duration at 27.2 Mc.

An analysis of echoes recorded simultaneously with visual observations of meteors during the delta-Aquarid and Perseid showers of 1949, for which it was possible to estimate (to within ± 10°) the angle of incidence of the radio wave at the meteor trail, showed that the ratio of durations was substantially independent of this angle. Values of the ratio for 28 meteors for which the duration at 27.2 Mc was greater than 4 sec are plotted in Fig. 2 as a function of the angle between the midpoint of the meteor trail and

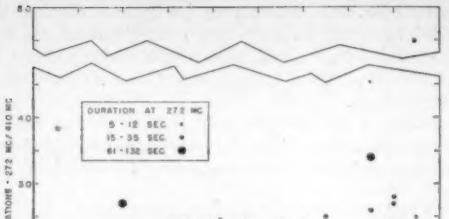

FIG. 2. Ratio of durations as a function of angle of incidence.

the shower radiant (complement of the angle of incidence). Correction for delay in the beginning of the echo (*3*) was made by reckoning duration from the time of visual appearance of the meteor. The time of visual appearance was recorded directly on the range-time record by the observer, who pressed an electric button switch each time a meteor was observed. An allowance of ½ sec was made for the observer's reaction time.

The median ratio in Fig. 2 is 2.3 ± 0.1, which is equal to the square of the ratio of wavelengths (2.27) within the probable error. During the shower observations, the powers and sensitivities were changed somewhat from the values used while obtaining the data in Fig. 1. The difference between the ratios in Fig. 1 and 2 is probably attributable to this.

As pointed out by Herlofson (*4*), simple diffusion of the ionization in a meteor trail, after the ionization has been dispersed so much that the incident radio wave intensity is not appreciably modified in passing through the trail, would result in a reduction of the echo amplitude in accordance with the formula

$$A = A_0 \exp(-16\pi^2 Dt/\lambda^2),$$

where A is the amplitude at time t, A_0 is the amplitude extrapolated to zero time, D is the diffusion coefficient for diffusion parallel to the direction of propagation of the radio wave, and λ is the radio wavelength. This formula holds true for any distribution of ionization density upon which diffusion alone is acting, subject to the condition that the incident wave is not appreciably modified in passing through. Thus, as noted by Herlofson, for a constant value of A_0 (approximately realized if power and sensitivity remain constant) the duration would be proportional to λ^2. On the average, the ratios of durations at 27.2 Mc and 41.0 Mc are in good agreement with this relation.

To account for long-enduring echoes, Herlofson suggested that abnormally low values of D would occur for the case of wave propagation nearly transverse to the earth's magnetic field if the transverse diffusion were markedly inhibited. Evidence for such an effect has been cited by Lovell (*1*). Because of the antennas used, our equipment was not well suited to record echoes from meteor trails for which the direction of wave propagation was nearly perpendicular to the earth's magnetic field; nevertheless, many long-enduring echoes were recorded. In Fig. 2 there are six examples of durations at 27 Mc which exceeded 1 min. In these cases the angle between the direction of wave propagation and the direction of the magnetic field, estimated from the visual observations, ranged from 20° to 50°. At these angles the inhibiting effect of the magnetic field would be small. Although this does not constitute evidence that the magnetic field effect does not exist, it shows that the effect is not necessary for the occurrence of echoes of substantial duration.

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Demineralization of Hard Tissues

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If calcium carbonate, basic component of certain hard tissues, is dissolved by the action of an acid reagent, the developing CO_2 bubbles are apt to destroy the pattern of the remaining organic material. Presented with the problem of how to avoid this inconvenience, one of us (H.) suggested an alkaline reagent to be used for the purpose, namely, a solution of the sodium salt of ethylene-diamine-tetracetic acid, whose interesting analytical application he has been studying for some two years (*1, 2*).

Because of the communication by Sreebny and Nikiforuk (*3*), we wish to make known our first observations, which, although incomplete, are very satisfactory.

The equation given by Sreebny and Nikiforuk leaves out of account the hydrolysis of the sodium salt or, more exactly, of the quaternary ion of the acid (represented by R^{----}).

$$R^{----} + H_2O \qquad RH^{---} + OH^-.$$

So, one of the possible formulations of the complex-forming reaction of the Ca^{++} ion is correctly[1]

$$RH^{---} + OH^- + Ca^{++} \qquad RCa^{--} + H_2O.$$

This elimination of OH^- ions is the phenomenon used in one of the analytical applications of the reagent. In the demineralization process, due to the same phenomenon, an efficient buffer has to be used

[1] For a complete account of the equilibria between all combining ions, see (*4*).

with the reagent if it is intended to maintain a constant pH value.

The complex-forming tendency between the reagent and trivalent iron is greater if the acid is neutralized by quaternary sodium pyrophosphate instead of NaOH; so the velocity of demineralization of iron containing tissue (stains) is notably increased.

The velocity of the demineralization increases notably if the treated material is suspended near the upper surface of a high column of reagent. The complex-containing solution, having a higher density, sinks down and so an automatic circulation and renovation of the reagent takes place. A mother-of-pearl button will be completely demineralized in 8–14 days.

Although the mother-of-pearl is almost floating in the solution after demineralization, its characteristic iridescence remains unaffected; hence, contrary to general opinion, the light diffraction is not due to the aragonit layers of the material, but to the micellar structure of its organic component, easily recognizable under the microscope.

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The Detection and Isolation of Naturally Occurring Strains of Tobacco Mosaic Virus by Electrophoresis[1]

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Previous work (*1*) has demonstrated the utility of electrophoretic analysis of plant cytoplasmic proteins in following the development of tobacco mosaic virus (TMV) in an infected tobacco plant. The virus component is distinguishable from the native cytoplasmic protein by its different electrophoretic mobility. A more extensive electrophoretic investigation has now revealed the presence of two virus components, which differ in electrophoretic mobility, in a naturally occurring mixture in the infected cytoplasms we have examined.

These two virus components exhibit symptomatic behavior closely similar to that of the Mild and Severe strains isolated by Johnson (*2*) by biological means from a similar source. We have utilized electrophoresis in separating the components, and have further distinguished them by serological methods. The following is an account of the results of this study, which will be reported in greater detail elsewhere.

The sample of TMV used in these studies was kindly supplied, in the form of an infected dry leaf, by James Johnson, of the University of Wisconsin. Electrophoresis experiments were performed in a 0.1 ionic strength buffer, pH 6.93, containing 0.08 *M* NaCl, 0.02 *M* Na cacodylate, and 0.0033 *M* cacodylic acid. Electrophoretic scanning patterns of the total cytoplasmic proteins extracted directly from infected leaves of Turkish tobacco are shown in Fig. 1. In addition to the fastest-moving virus component represented by the large, spikelike peak (*a*) and the more diffuse mound (*b*) representing the normal cytoplasmic proteins of intermediate mobility, there is also present a small amount of a third component producing a spikelike peak (*c*) on the slow side of the cytoplasmic protein boundary. The main virus component constitutes about 40% of the total protein, whereas the third minor component, which was later proved also to be virus protein, represents only about 5% of the total cytoplasmic protein. A fourth, still slower-moving component (*d*) of unknown nature is also present.[4]

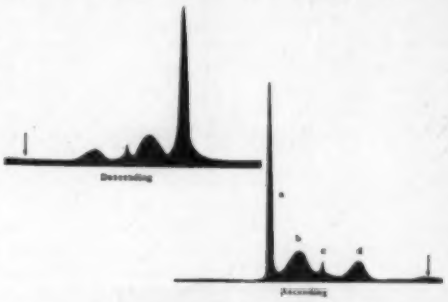

FIG. 1. Electrophoretic scanning patterns obtained in the Swingle Tiselius apparatus (*5*) of whole cytoplasmic proteins extracted from Turkish tobacco plants infected with tobacco mosaic virus; 18,000-sec migration in 0.1 μ NaCl-cacodylic acid buffer, pH 6.93, at a potential gradient of 5.10 v/cm; 1% total protein. Arrows indicate positions of starting boundaries.

In order to have enough material available for the electrophoretic isolation of the minor component, another group of Turkish tobacco plants was infected with TMV, and about 2 weeks after infection the virus was isolated according to previously described procedures (*3*). The virus preparation, freed from the lower molecular weight normal proteins and the com-

[1] This work was supported, in part, by financial grants from the National Foundation for Infantile Paralysis, Inc., and the U. S. Public Health Service. We are indebted to Jean Campbell, Alice McColloch, and Mary Hull for their assistance in the work.

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[4] This sample of cytoplasm was extracted from a mature leaf 16 days after it was inoculated with the virus, and it may be that the extra component arises from degenerative processes that occur in the leaf protoplasm as the result of virus infection. This component does not appear in cytoplasms extracted from healthy leaves.

ponent (*d*) mentioned above, was recycled by the centrifugal method of Stanley (*4*), except that the cacodylic acid buffer described above was used as a solvent instead of water. When examined electrophoretically in this buffer, the preparation was resolved into three spikelike peaks, the two slower-moving components constituting less than 10% of the total virus preparation, as shown in Fig. 2*A*. The

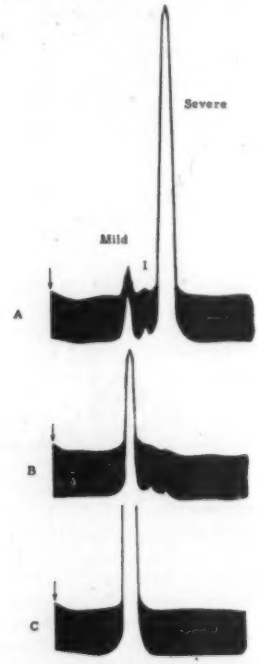

FIG. 2. Scanning patterns from the descending limb of the Perkin-Elmer electrophoresis cell containing various samples of tobacco mosaic virus; 5,280-sec migration time at a potential gradient of 5.84 v/cm. NaCl-cacodylic acid buffer, pH = 6.93, $\mu = 0.1$. Arrows indicate positions of starting boundaries. *A*, Original mixture isolated from *N. tabacum*. *B*, The Mild-component (component *c* in Fig. 1) after isolation by electrophoretic means. *C*, The Mild-component after passage through a single lesion produced on *N. glutinosa* and then propagated and recovered from *N. tabacum*.

component labeled *Severe* corresponds to component *a*, and *Mild* to component *c*, in Fig. 1. The component of intermediate mobility (*I*), which is obscured by the normal protein (component *b* in Fig. 1) in diagrams of infected whole cytoplasm, has repeatedly appeared in preparations of isolated virus obtained from plants infected with the original inoculum of TMV. The nature of this component is discussed below. The mobilities of the Severe, *I*, and Mild components in the descending limb of the electrophoresis cell are -7.8, -6.2, and -4.8×10^{-5} cm/sec/v/cm, respectively.

In all, about 2 g of the virus mixture was prepared and used for the electrophoretic isolation of the minor component of smallest mobility. The preparation was concentrated to about 3% total protein, divided into several samples, and each sample was subjected to prolonged electrophoresis in the Tiselius apparatus designed by Swingle (*5*). When sufficient separation of the virus components had occurred, a capillary tube was lowered into the descending limb of the electrophoresis cell, and the tip of the tube was accurately positioned by means of the optical system in such a way that the slowest-moving component (Mild) could be withdrawn from the mixture. Six individual analyses produced enough of the Mild-component so that it could be subjected to electrophoretic analysis in a Perkin-Elmer Model 38 apparatus. The results are shown in Fig. 2*B*. It is evident that the isolated component is nearly homogeneous, since only traces of the major (Severe) and intermediate minor (*I*) component can be identified in the pattern.[5]

Further examination of the isolated component in the analytical ultracentrifuge showed it to be indistinguishable in sedimentation rate from the other virus components of the mixture. Electron micrographs[6] revealed the Mild component to consist of rodlike particles very similar to ordinary TMV. The Mild component did not differ from ordinary TMV in either nitrogen or phosphorus content. Thus, apart from their difference in electrophoretic mobility, the two virus components have not yet otherwise been differentiated on physical and chemical grounds. However, biological studies readily proved the major (Severe) and the minor (Mild) component to yield different symptoms as evidence of viral activity.

The original mixture, containing largely Severe-type virus, was compared with electrophoretically isolated Mild-type by inoculation to Turkish tobacco. Whereas the mixture uniformly induced severe mosaic symptoms, the Mild isolate induced a variety of mosaic patterns. The most severe were like symptoms of the original mixture; the least severe, a mild mottle with little rugosity. The latter symptoms were obtained when the Mild inoculum was diluted to a level that reduced the chance of including the Severe-type, which was known to be present from previous electrophoretic analysis, among the infecting virus particles.

The Mild-type virus was readily separated from all traces of Severe-type by inoculation from a single lesion produced on *Nicotiana glutinosa* at high dilution of the Mild preparation isolated by electrophoresis. Tobacco plants inoculated from this single lesion isolate had only mild symptoms. Virus extracted from the infected plants migrated under a single boundary, as shown in Fig. 2*C*, and the electrophoretic mobility of the virus in the descending limb of the electrophoresis cell was the same (-4.8×10^{-5} cm/sec/

[5] It is of interest to note that in contrast to the behavior of the sedimentation constant of TMV, which is highly concentration-dependent (*6*), there is remarkably little variation in the electrophoretic mobilities of these components in spite of large changes in their concentrations.

[6] We are indebted to R. F. Baker, of the School of Medicine of the University of Southern California, for performing these experiments.

v/cm) as that of the slowest-moving component of the original mixture.

The Severe-type virus was readily obtained in an electrophoretically homogeneous condition by applying the original mixture to *N. glutinosa* at high dilution and then transferring from a single lesion to *N. tabacum*. The severe symptoms induced by the virus were not changed by this selective treatment, but the virus, when isolated from infected plants, migrated under a single peak in the electrophoresis apparatus and had a mobility identical with that of the prominent component of the original mixture (-7.8×10^{-5} cm/sec/v/cm).

The electrophoretically homogeneous preparations of Severe and Mild virus proteins, respectively, obtained after purification by the local-lesion technique and subsequent systemic infection of *N. tabacum*, were examined for their serological characteristics. Antisera produced in each of two rabbits, against the Mild virus, precipitated the Severe-type virus as they did the Mild-type, and there was little difference between the two virus preparations in terms of their qualitative reaction to these antisera. Quantitative analysis of the precipitate, however, showed that only part of the antibody to Mild-type was precipitated by the Severe-type; evidently the remainder was specific for antigenic components of Mild-type not found in Severe. This was confirmed, again in quantitative fashion, by absorbing, with the Severe-type, antisera to the Mild-type. When all the antibody capable of reacting with the Severe-type was removed by successive small additions of the antigen, and subsequent centrifuging of the precipitates, a measurable amount of antibody, specific for the Mild-type, remained in the supernatant. Excess antigen, added in the final absorption, was removed by centrifuging the absorbed serum for 1 hr at 30,000 rpm in the Size 40 head of a Spinco Model L centrifuge.

Similarly, antisera produced in three rabbits by injecting Severe-type virus showed both Severe-specific and cross-reactive antibody. In all cases, absorbing antiserum with the antigen against which it was produced removed all detectable antibody from it. It seems clear, therefore, that the Mild-type and the Severe-type virus proteins are serologically similar, but not identical, antigens.

We have not yet attempted the isolation of the component *I* (Fig. 2) from the original virus mixture. TMV is known to form aggregates under certain conditions, and it occurred to us that if aggregates were to form containing one molecule of the Severe and one molecule of the Mild strain, these dimers would migrate with the mobility of the *I*-component. In order to test this possibility, a mixture of roughly equal proportions of electrophoretically homogeneous preparations of the Mild and Severe strains was prepared at about 2% total protein in the cacodylic acid buffer, and was kept at 4° C for 1 week before it was subjected to electrophoresis. The diagram indicated the presence of only the Severe and Mild strains. Upon centrifuging down the TMV mixture and resuspending it in buffer, however, a significant amount of a peak with the mobility and appearance of the *I*-component appeared in the electrophoresis diagram. Whether all the *I*-component is simply the dimer of the Severe and Mild strains is at present undecided. The possibility exists that an independent strain with the mobility of the *I*-component is also present in the original mixture.

Some other strains of TMV, which have been isolated biologically, possess electrophoretic properties different from common TMV. The rib-grass strain (*7*) has a different isoelectric point (*8*) from that of the common variety, and a yellow-spot strain (*flavum*) studied by Friedrich-Freksa *et al.* (*9*) exhibits a pH-mobility relationship different from that of the common strain. Recently Oster (*10*), by means of a turbidometric method, has determined the apparent isoelectric points of several purified strains of TMV. In addition, we have recently examined a local strain of TMV which produced mosaic symptoms in *N. tabacum* differing in some respects from those produced by common TMV. Electrophoretic analysis demonstrated that the major component, constituting about 95% of the centrifugally isolated virus protein, had a mobility in the cacodylate buffer described above of -5.0×10^{-5} cm/sec/v/cm, markedly different from that of the Severe-type TMV. Mixed with this component was about 5% of another component with a mobility of -4.3×10^{-5}. Neither of these components has as yet been purified, but it is likely that both are strains of TMV. It may be of some significance that, of those few strains of TMV that have been discovered to have electrophoretic properties differing significantly from those of the common variety, all have been shown to have more alkaline isoelectric points or smaller anionic mobilities than common TMV.

Investigations are now in progress to elucidate the biological relationships and interactions among these strains of TMV, and to characterize the virus proteins more thoroughly by physical, chemical, and serological means.

The studies reported in this paper have further indicated the utility of electrophoresis in plant virus studies. Electrophoretic properties not only serve as precise characterization of different strains of viruses, but may also provide a means of recognizing the possible presence of strains otherwise difficult to detect, and of greatly facilitating their ultimate isolation and purification by biological means.

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Response of Meristems of Seedlings to Benzene Hexachloride Used as a Seed Protectant[1]

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Benzene hexachloride is the active ingredient in several commercial insecticidal seed protectants. Seed technologists have noted that a heavy dosage of the protectant produces malformed radicles and plumules. Cytological examination of these structures shows that the response of the meristems is similar to that obtained with several compounds that are used as fungicides (*1*), herbicides (*2*), or polyploidizing agents (*3, 4*).

The gross aspects of the somatic prophase seem to be normal. Abnormal nuclear behavior becomes evident at early anaphase. Normal chromosome separation does not occur. Total failure of separation produces a large, polyploid restitution nucleus. Irregular separation produces a multinucleate cell in which the several nuclei may have from a few to a very large number of chromosomes.

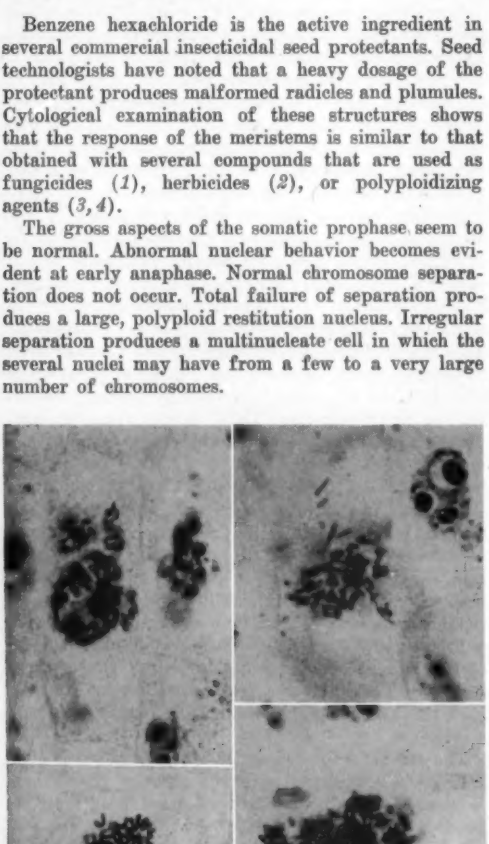

FIG. 1. Abnormal mitotic figures in cells of root tip of *Zea*.

Cell division is completely inhibited, but considerable cell enlargement occurs. Elongation of the radicle and plumular organs is retarded and eventually stopped, and the organs become greatly thickened. Breakdown of tissues occurs and the seedling dies. The responses of maize, garden pea, and soybean are essentially similar (Fig. 1). The cytological figures in the above plants are very similar to figures from various animal cancers (*5*).

[1] Journal paper No. J-1956 of the Iowa Agricultural Experiment Station, Ames. Project No. 858.

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The Inhibition of Hematopoietic Action of Cobalt by Ethylenediamine Tetracetic Acid (EDTA)

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Ethylenediamine tetracetic acid (EDTA) reacts with metallic ions to form soluble nonionic metal chelate compounds. The stability of these complexes is so great that the metallic ions are practically completely inactivated (*1*). The chelation is preferential; that is, one metal will be complexed before another. In preliminary experiments on rats, it was found that the toxicity of mercury, copper, and lead was reduced by the simultaneous administration of the sodium salt of EDTA. It was of interest to determine whether EDTA could inhibit the hematopoietic activity of cobalt. The addition of 0.5% of cobalt to the food of rats has been shown to raise the red count to 11 million and the hemoglobin to 165% (*2*). This polycythemia occurs in all vertebrates on which experiments have been tried (*3*).

The rats used in our experiments were from an inbred strain derived from Wistar stock. They were fed Purina dog chow, which was contaminated with the chemicals used in the experiments. The sodium salt of EDTA[1] and cobaltous acetate were used. Thirty female rats, each weighing about 200 g, were

TABLE 1

INHIBITION OF THE HEMATOGENIC ACTION OF COBALT EDTA IN ALBINO RATS

	Concentration of chemicals in food		Blood analyses			
Group	Cobalt (%)	EDTA (%)	Red blood count ($\times 10^6$)	Hemoglobin (g/100 ml)	Hematocrit (%)	White blood count ($\times 10^3$)
1	0	0	8.9	15.5	50.4	8.2
2	0.1	0	12.2	20.6	59.6	12.4
3	0.1	0.2	11.3	18.4	57.6	11.0
4	0.1	1.0	10.3	18.0	55.0	10.5
5	0.1	5.0	9.0	15.5	51.0	13.2
6	0	5.0	8.7	15.7	50.8	11.5

[1] Generously supplied by the Bosworth Chemical Co.

divided into 6 groups and given the food containing the chemicals in concentrations as indicated in Table 1. The rats were weighed weekly. After 4 weeks they were sacrificed by guillotine, and blood analyses were performed by the usual clinical methods.

Table 1 summarizes the results. Cobalt produced the usual increase in red blood cells, hemoglobin, and hematocrit. The animals fed 0.2% and 1% EDTA along with the cobalt showed some diminution of the cobalt effect. There were no essential differences in the blood counts of those animals given 5% EDTA, with or without cobalt, and the controls. The rats in all the groups appeared normal in all outward respects during the course of the experiment and suffered no loss of weight. No gross pathological conditions were discernible at autopsy.

References

1. DAUGHERTY, T. H. *J. Chem. Education*, **25**, 482 (1948).
2. WALTNER, K., and WALTNER, K. *Klin. Wo-chschr.*, **8**, 313 (1929).
3. SUTTER, *J. Compt. rend. soc. biol.*, **116**, 994 (1934).

Device for Stirring Liquids under Reduced Pressure in the Absence of Air and Mercury[1]

Lawrence J. Heidt and Gerald George Palmer

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In the course of investigations concerned with liquid solutions that had to be thoroughly stirred in the absence of foreign gas, particularly air and mercury, we have made several improvements in an apparatus designed by L. J. Heidt (*1*) for this purpose, especially for the study of photochemical reactions produced by the irradiation of such solutions in a stationary reaction vessel. Heidt's description is very brief and is not accompanied by a sketch or any details of construction, since it is given incidental to some other work. The improved model is sketched in Fig. 1. The device operates by rotating in air a strong magnet, which turns an iron rotor inside a vacuum chamber made of brass.

Among the improvements is the construction of the vacuum chamber in such a way that there is easy access to the parts within it, especially the bearings, which need to be cleaned and lubricated frequently. Access to these parts is obtained by disengaging the joint marked *A* in the sketch.

Another improvement is the provision for adjustment of the force between the magnet and the rotor so that this force can be kept small enough not to break the glass stirrer when it becomes stuck in the reaction vessel. This adjustment is made by means of the screw so marked at the top of the sketch of the vacuum stirring head.

[1] The work on this device was assisted by a grant-in-aid from the Charles F. Kettering Foundation as part of its integrated program of research on the photosynthesis problem.

A third improvement is the use of commercial-turned cone-thrust ball bearings instead of conical steel pins riding in brass; the latter often gave rise to great changes in the speed of stirring, because it was practically impossible to lubricate them adequately when they were operated continuously for several days. The ball bearings can be lubricated satisfactorily with Apiezon M vacuum stopcock grease.

Most of the device is constructed of brass, but the shaft driving the magnet is made of cold rolled steel, and the shaft attached to the rotor and the chuck at-

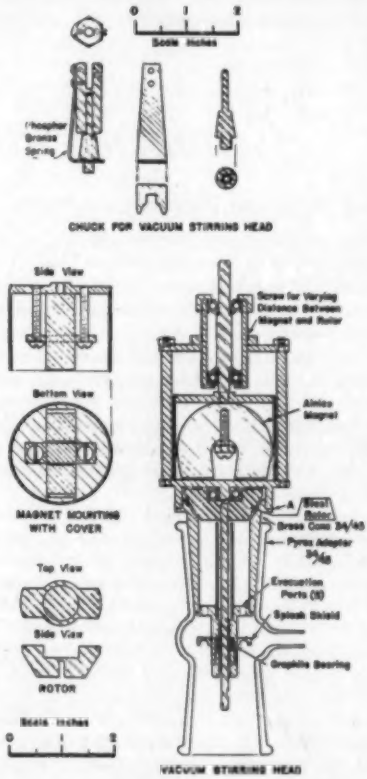

FIG. 1.

tached to this shaft are made of stainless steel. The shaft of the glass stirrer is held in the chuck by de Khotinsky or Sauereisen Insulate cement when the reaction mixture is made up of water or an organic solvent, respectively. The thrust-type ball bearings are Nice No. 702, 11/16 in. OD, and accommodate a 3/16-in. shaft.

The magnet is surrounded by a brass shield, primarily for safety. The flat top on the magnet was ground there to facilitate mounting. The plate holding the screw for adjusting the position of the magnet is held in place by three equally spaced posts, only two of which are shown in Fig. 1. Other details of con-

struction are apparent from the sketch. The device may be supported conveniently by a ring clamp, which grasps the cylindrical section of the vacuum stirring head immediately above *A*.

The joint marked *A* in Fig. 1 was made vacuum-tight by applying a thin layer of de Khotinsky cement to the shoulder at *A* while the male part of the joint was disengaged from the female part and heated gently to 140° C. The former was then screwed into place, and the parts around *A* were warmed until the cement also wet the female part. The parts were screwed together tightly while hot and allowed to cool slowly to room temperature.

The vacuum chamber and the standard taper adapter were snugly fitted together by lapping them with silicon carbide, grit No. 600, after which all traces of abrasive were removed by scrupulous cleaning. This joint was lubricated with Apiezon M grease in the usual manner and held together by a steel leash under tension. No trouble has been encountered in obtaining a vacuum, but the first degassing of the device occasionally requires more than a day before a vacuum of 10^{-4} mm Hg can be held overnight.

Reference

1. HEIDT, L. J. *J. Chem. Phys.*, **10**, 300 (1942).

Comments and Communications

Geology *Is* in the Elementary Schools

DORSEY HAGER'S plea for the teaching of geology in the grade schools (SCIENCE, 114, 19 [1951]) reflects the concern of one who has undoubtedly experienced, enjoyed, and profited from both the formal and informal study of the earth sciences. There is no question that children of grade school age would also profit from more firsthand experiences with rocks, minerals, and physiographic forms. However, the approach suggested by Hager, involving new courses, simple geological texts, and the teaching of "geology as the Mother of Sciences, not as one of the natural sciences," is open to question.

It is becoming axiomatic that children, not subjects, are the concern of the grade schools. The past generation has seen a marked trend away from isolated subject courses of all types. Newer curricula based on findings in the fields of psychology and child development have taken their place. Grade school teachers would be loath to see geology introduced as a separate subject, despite the intrinsic value of the earth sciences, which they have long recognized.

The actual situation is not nearly as "outrageous" as Hager claims. In the opinion of the writer, it is hopeful and promising, although there is ample room for improvement. The scope and standards of elementary education do vary widely in different parts of the country. Localities may be found where science education is meager or absent. For the country as a whole, however, science education in the grade schools is constantly increasing, and materials from the fields of geology are included at nearly every grade level in the schools where science is taught. Even a casual survey of the textbooks used in elementary science will show much material from the field of geology. Land forms, soil, erosion, rocks and minerals, ore deposits, glaciation, mountain building, stratigraphy, fossils, weather, and climate are some of the topics included in ways that are appropriate to the age level and interests of the child.

The textbook series used in the elementary grades includes material on all the topics Hager uses as illustrations: erosion, building materials, rock identification, mineral fuels, metals, fossils, and the solar and stellar systems. When astronomy is included with geology, as Hager recommends, the space allotted in the textbooks reaches major proportions. As expected, the material is more advanced in the intermediate and upper grades than in the primary grades. Analyses of textbook content (Michals, B. E. *Science Education*, 34, 248 [1950]) indicate the detailed distribution from grade to grade. In addition to textbooks, the elementary schools make considerable use of popularly written scientific books. A number of writers, especially Carroll Fenton and Lilian Strack, have produced excellent books packed full of geologic data which children use and enjoy. There is ample evidence from books and from state and local courses of study that the earth sciences are not neglected in the elementary schools.

A problem which Hager does not mention, and which is of greater concern to those working in science education, comes from the fact that science teaching in the elementary grades is relatively new. Because of this, classroom teachers who have had very little, or no training whatever, are trying to do the best they can with this subject. Teacher training institutions have only begun to prepare teachers for this work. Their efforts so far are limited. For this reason, teachers all over the country need and are anxious to have the kind of help that people like Hager and others, trained in the earth sciences, can offer. Why don't these geologists let local school boards, principals, and teachers know of their interest in science education? Let them indicate some specific ways they can help teachers—e.g., with field trips, specimens, demonstrations, or lectures. This could be a practical first step toward the goals set forth in Hager's communication.

There is no doubt, as Hager indicates, that the earth sciences are much more vital than some college texts

indicate. They should, and do, have a place in grade school science teaching. Educators are anxious to have all the help that geologists can give in improving the caliber of this teaching in the schools.

HERBERT S. ZIM

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University of Illinois, Urbana

Mail for Indonesia

ON page 367 of SCIENCE for March 30, 1951, I read a communication of A. B. Gurney about the new Indonesian names of some towns in this country and about the attitude of Indonesian postal officials toward the former Dutch names. On the authority of Mr. Hooyer, of Leiden, Mr. Gurney writes: "as that bearing Dutch place names is likely not to be delivered because of the present attitude of postal authorities in the Republik Indonesia Serikat (R.I.S.)" [the correct name is R.I.: Republik Indonesia].

Now from my own experience I can assure you that this statement is *entirely wrong*. After the change of the government the Indonesian postal authorities published a communication in the papers that mail from the interior would be returned to the sender if it did not bear the new Indonesian address. But at the same time it was stated that foreign mail would be delivered in any case.

As professor at the Department of Veterinary Science, University of Indonesia at Bogor (Buitenzorg), I am charged with the care of the library of our department. Our mail amounts to about 400 letters and printed matter monthly. Most of them bear the new addresses, but some of our correspondents still use the old Dutch names of the departments, streets, or places. And I can assure you that there was never any delay in the receipt of our mail, nor any loss of mail due to these Dutch addresses. I discussed this matter with some other people here and they have had the same experience.

As a proof I enclose 18 covers of letters (4 from Holland, 3 from England, 1 from Norway, 1 from Denmark, 1 from Eire, and 8 from the USA) from the mail of last week, all bearing the old Dutch names of the departments, institutes, streets, and place, and all promptly delivered here.

Our address in Dutch is:

Bibliotheek van de Faculteit der Diergeneeskunde
Van Imhoffplein 1
Buitenzorg

The new Indonesian address is:

Perpustakaan Fakultet Kedokteran Hewan
Taman Kentjana 1
Bogor

The most important changes of names are: Batavia = Djakarta, Buitenzorg = Bogor, Cheribon = Tjeribon, Fort de Cock = Bukit Tinggi, Borneo = Kalimanten, Celebes = Sulawesi. A list of the new Indonesian names of departments, institutes, services, libraries, etc., can be obtained from the secretary of the Organization for Scientific Research, Merdeka Selatan 11 pav., Djakarta.

It is possible that one of the subordinate postal officers caused some trouble in delivering foreign mail with Dutch addresses, but this certainly may be regarded as an exception, and it is not the attitude of the postal *authorities*. Although it is much better to use the new Indonesian names, you may be sure that mail from abroad with the old names or with addresses written in English will be promptly delivered.

You will favor me very much indeed by publishing a rectification of Mr. Hooyer's communication, because wrong ideas about postal matters in Indonesia are not a favorable basis for our scientific relations with colleagues and institutes in other countries.

E. J. SLIJPER

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University of Indonesia
Taman Kentjana 1, Bogor

WE HAVE been reading the letter by Ashley B. Gurney in your March 30 issue (SCIENCE, 113, 367 [1951]).

By surface mail the second edition of *Guide of Scientists in Indonesia*, O. S. R. Bulletin 10, has been dispatched to you, in order that contacts between scientists in your country and Indonesia may be less hampered due to faulty addressing. This bulletin, like all other editions of the Organization for Scientific Research in Indonesia, is already being mailed to about a hundred scientific institutions of the USA.

You will note that a large number of scientists and scientific institutions may be reached through the secretaries of:

Organization for Scientific Research, Medan Merdeka Selatan 11, Djakarta
Science Council of Indonesia, c/o Medan Merdeka Selatan 11, Djakarta
Akademi Nasional, Taman Matraman 15, Djakarta
Gadjah Mada University (Prof. Dr. Poesponegoro), Setinggil, Jogjakarta
Balai Perguruan Tinggi Republik Indonesia (University of Indonesia), Salemba 6, Djakarta

G. BROERSMA

Organization for Scientific Research
Djakarta, Indonesia

An Error Has Crept In

WITH respect to my letter to SCIENCE (114, 332 [1951]), entitled "How Does the Ivy Grow?" I regret that either in the composition of this note for publication or in a typographical error in the original, an error has crept in. For the rate computed in mm/min, the value should read 0.05 mm/min, not 0.5 mm/min as printed. Even with this decrease in rate, the growth of this shoot was still considerable.

SUMNER ZACKS

Harvard Medical School

Book Reviews

Ultrasonics. P. Vigoureux. New York: Wiley, 1951. 163 pp. $4.00.

Dr. Vigoureux has written a short but authoritative monograph which will be useful as an introduction to the field of ultrasonics. The book is distinguished by the emphasis given to basic research since 1946 and on this account especially will commend itself to workers in the field.

The experimental methods section of the book is particularly complete. The pulse technique for measuring the velocity and attenuation of sound is described as some length. Although the author discusses ultrasonic propagation in liquids and gases, he does not include a chapter on solids, so that the important application of the pulse technique to the measurement of the elastic constants of single crystals is not treated. On the same account, the beautiful studies of Mason and McSkimin on transmission in polycrystalline solids are not mentioned.

It is satisfying that L. Hall's theory of the excess absorption in water as caused by molecular rearrangement under pressure has so quickly found its way into a textbook, as this theory considerably clarifies a central problem in the field. In discussing propagation in liquid helium II, it is unfortunate that Vigoureux refers to the phenomenon of second sound as "thermal waves," as this carries an erroneous connotation.

CHARLES KITTEL

Department of Physics
University of California, Berkeley

Life in a Mexican Village: Tepoztlán Restudied. Oscar Lewis. Urbana, Ill.: Univ. Illinois Press, 1951. 512 pp. $7.50.

Seventeen years after the anthropologist Robert Redfield gave us his classic work *Tepoztlán—A Mexican Village,* Oscar Lewis, associate professor of anthropology at the University of Illinois, decided to go to Tepoztlán and take a second look. This covered a period of approximately two years, and his book is the result of his intensive study of the village—its history, institutions, and people.

What had happened in Tepoztlán in the 17 years since Redfield made his study? How profound were the changes? How had the native institutions been affected? To what extent had the villagers become incorporated into the main stream of national life? In short, had the people and their way of life really changed? These and many other questions were posed by Dr. Lewis—questions of more than local interest because the changes that had occurred in Tepoztlán were symptomatic of the changes all over Mexico and the world.

This new study employed a combination of anthropological, sociological, and psychological research tools — participant-observer interviews, autobiographies, case studies, surveys, and the Rorschach, Thematic Apperception, Grace Arthur Performance Scale, and other psychological tests. Carefully selected families, belonging to the various socioeconomic levels of the village, were intensively studied. The studies were not included in this volume for lack of space, but the material was used in the interpretations of interpersonal relations.

The book is organized into two parts: Part I, "The Village and its Institutions," and Part II, "The People." Part I provides the reader with a broad frame of reference for the understanding and interpretation of much of the psychological data contained in Part II. Throughout, there is an attempt to understand Tepoztecan culture as a whole, as an integrated way of life, and as part of the larger Mexican scene.

In "The People," Lewis does not try to fit his data into any one of the popular formulations in the culture-personality field, but has chosen to limit himself to a description of the quality of interpersonal relations. This material represents the most complete published description of interpersonal relations for a Latin-American peasant community.

How do the findings of this study differ from the earlier work of Redfield? In his summary, the author describes some of the differences by saying:

> When this study was begun I did not anticipate that there would be any fundamental differences between our findings. In the course of the work, however, many differences did emerge, ranging from discrepancies in factual details to differences in the over-all view of Tepoztecan society and its people. . . . Redfield's picture of the village has a Rousseauan quality which glosses lightly over evidence of violence, disruption, cruelty. . . . We are told little of poverty, economic problems or political schisms. Throughout his study we find an emphasis upon the cooperative and unifying aspects of Tepoztecan society. Our findings, on the other hand, would emphasize the underlying individualism of Tepoztecan institutions and character, the lack of cooperation, the tensions between villages within the municipio . . . and the prevailing quality of fear, envy and distrust in inter-personal relations.

The last chapter examines these differences in more detail and attempts to explain them.

The Lewis study is an exciting contribution to the knowledge of the fundamental processes and principles of culture change in Indian villages. As Robert Redfield says about this book:

> Dr. Lewis has written an account of a Mexican people that is rich in fact and provocative in ideas, because he ably presents this people as existent institutions, as histories and as personalities, bringing these aspects of the reality into illuminating interrelationships. . . .

The volume is beautifully presented, and Beltran's fine drawings well illustrate it.

JUAN COMAS

Instituto Indigenista Interamericano
Mexico, D. F., Mexico

Scientific Book Register

The Pectic Substances. Z. I. Kertesz. New York–London: Interscience, 1951. 628 pp. $13.50.

The Chemical Technology of Dyeing and Printing: Substantive, Basic, Acid and Pigment Colors, Aniline Black, and Dyestuffs for Acetate Rayon and Synthetic Fibers. Louis Diserens; trans. and revised from 2nd German ed. by Paul Wengraf and Herman P. Baumann. New York: Reinhold, 1951. 446 pp. $12.00.

Vitamin Methods, Vol. II. Paul György, Ed. New York: Academic Press, 1951. 740 pp. $14.50.

American Sociology: The Story of Sociology in the United States through 1950. Howard W. Odum. New York–London: Longmans, Green, 1951. 501 pp. $5.00.

Mineralogy: An Introduction to the Study of Minerals and Crystals. 4th ed. Edward Henry Kraus, Walter Fred Hunt, and Lewis Stephen Ramsdell. New York–London: McGraw-Hill, 1951. 664 pp. $7.50.

A History of Science, Technology, and Philosophy in the 16th & 17th Centuries (Wolf). Rev. ed. by Douglas McKie. London: Allen & Unwin; New York: Macmillan, 1950. 692 pp. $7.00.

Nomographic Charts. C. Albert Kulmann. New York–London: McGraw-Hill, 1951. 244 pp. $6.50.

College Zoology. 6th ed. Robert W. Hegner and Karl A. Stiles. New York: Macmillan, 1951. 911 pp. $6.00.

Grundlagen der Atomphysik: Eine Einführung in das Studium der Wellenmechanik und Quantenstatistik. 4th ed. Hans Adolf Bauer. Vienna: Springer-Verlag, 1951. 631 pp. $10.70.

A Color Atlas of Morphologic Hematology with a Guide to Clinical Interpretation. Geneva A. Daland; Thomas Hale Ham, Ed.; illus. by Etta Piotti. Cambridge, Mass.: Harvard Univ. Press, 1951. 74 pp. $5.00.

Physiology of the Fungi. Virgil Greene Lilly and Horace L. Barnett. New York–London: McGraw-Hill, 1951. 464 pp. $7.50.

The Organization of Bones. P. Lacroix; trans. from rev. French ed. by Stewart Gilder. Philadelphia: Blakiston, 1951. 235 pp. $6.00.

Physical Biochemistry. 2nd ed. Henry B. Bull. New York: Wiley; London: Chapman & Hall, 1951. 355 pp. $5.75.

Association Affairs

AAAS Policy

A MEETING was held September 13–15 at Arden House, near Harriman, N. Y., at which the Executive Committee of the AAAS, together with a group of invited consultants, considered the basic policy and program of the AAAS. The questions studied had been previously set forth in a statement printed in SCIENCE (114, 246 [Aug. 31, 1951]).

The Arden House meeting gave consideration to a variety of detailed aspects of the present program of the AAAS and to the ways in which these might or should be modified. But the chief aim of the meeting was to discuss fundamental questions of purpose, policy, opportunity, and obligation. Once a clear and agreed framework of policy is established—and really not until then—effective approach can be made to the problems of instrumentation of policy.

It is impossible to report adequately in a brief space the full content or value of this important meeting. The conclusions tentatively reached are purely advisory in character. The group unanimously adopted a summary statement. In its formal meeting on September 16, the Executive Committee of the AAAS accepted the report of the conference of the preceding days and instructed the Administrative Secretary to publish, both in SCIENCE and in THE SCIENTIFIC MONTHLY, the summary report of the Arden House Conference.

It is most earnestly urged that every member of the AAAS study this statement carefully, and that every member who approves it, or who wishes to suggest additions, deletions, or changes in emphasis, will write his opinion to Howard A. Meyerhoff, Administrative Secretary of the AAAS, 1515 Massachusetts Ave., N.W., Washington 5, D. C. Our Association should approach these important issues in a democratic way; and this places an obligation on each individual member.

At the next annual meeting, in Philadelphia, this matter will be considered by the Council of the AAAS. If this statement of policy appears to be generally approved by the AAAS, or if a satisfactory substitute statement can be produced, the Executive Committee plans then to set up a series of committees to study scientifically the practical problems of implementing the policies.

The statement of the Arden House Conference is as follows:

A Statement of Policy for the AAAS

Whatever its obligations to other groups and whatever its opportunities in wider fields, the AAAS is an organization of scientists for science. The AAAS must, first of all, serve scientists and science in such a way as to command the confidence and backing of the scientists of this country. Otherwise it will be in no position to meet its wider opportunities.

This central principle indicates the necessity that the AAAS re-examine those of its activities which relate primarily to the internal affairs of science in this country, improve these activities, and extend them when and where that seems desirable in view of present circumstances. This must in particular involve a most careful review of the program and policy in respect to meetings,

publications, service to scientific societies and similar groups, aids to research, and various aspects of the interrelations of science and government.

There should be explicit mention of one particularly important aspect of this internal problem of service to science. We have reached the stage where one over-all organization cannot effectively deal with the intensive and specialized interests of individual branches of science. The technical papers that present detailed results in chemistry, in physics, in mathematics, in zoology, etc., can more properly be presented before meetings sponsored and arranged by the appropriate professional groups.

It is thus clear that the AAAS should not attempt to hold to a pattern of annual meetings that was natural and effective many years ago, but which is now outmoded.

This is, in fact, only one aspect of an important general principle. In view of the present size and complexity of science, in view of the seriousness and importance of the relation of science to society, and in view of the unique inclusiveness of the AAAS, it seems clear that this organization should devote less of its energies to the more detailed and more isolated technical aspects of science, and devote more of its energies to broad problems that involve the whole of science, the relations of science to government, and indeed the relations of science to our society as a whole.

This increased emphasis on broad problems should lead to new activities in wider fields, but it also requires a modification of what the AAAS tries to do with and for science. Thus it seems clear that a major present opportunity for the AAAS within science is to act, in all ways that promise useful results, as a synthesizing and unifying influence. As an obvious example, this indicates meetings at which one branch of science is interpreted to the other branches of science, meetings at which are stressed the interrelations between the branches of science, meetings which cultivate borderline fields, and meetings at which the unifying theme would be central problems whose treatment requires the attack of several disciplines.

This opportunity to try to "put science back together" seems so important that it may be wise to modify the existing statement [quoted in the next paragraph] of the purpose of the AAAS to include more specific dedication to synthesizing activities. Such activities are, of course, wholly consistent with the present statement of purpose; but if in fact this is, as some of us feel to be the case, the major present internal opportunity of the AAAS, then it deserves explicit statement.

Finally, this same emphasis on over-all problems demands that the AAAS not only recognize but attack the broader external problem of the relation of science to society. It seems to us necessary that the AAAS now begin to take seriously one statement of purpose which has long existed in its constitution. To quote :

> The objects of the American Association for the Advancement of Science are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, *and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.*

It is clearly recognized that the diffusion among the general public of knowledge about science and its methods is a difficult, slow, and never-ending job. It would require staff, money, patience, and wisdom. It would involve failures, and it would at some points strain the professional sensitivities of scientists. But in our modern society it is absolutely essential that science—the results of science, the nature and importance of basic research, the methods of science, the spirit of science—be better understood by government officials, by businessmen, and indeed by all the people.

We enthusiastically reaffirm our belief in the statement quoted just above as the culminating object of the AAAS; and we favor the adoption, after suitable study, of activities in this field as a major active interest of the AAAS.

It is recommended that this tentative statement of general policy be placed before the whole membership of the AAAS, and that it be sent to all the members of the Council, accompanied by a request for serious consideration and response. As soon as democratic procedures indicate that the above statement, or some then available modification of it, represents a consensus, the Executive Committee should set up a series of committees to study the practical and detailed problems of implementing these principles.

These studies themselves should be carried out in a scientific manner, with disregard of vested interests, with tempered concern for traditional procedures, and with imagination in respect to the present and future. Various aspects of the studies can doubtless be usefully aided by the methods of operations research, so that judgments can be at least partially founded on fact as well as on opinion.

Executive Committee of AAAS	Special Consultants
Roger Adams	Philip B. Armstrong
John R. Dunning	J. H. Bodine
Detlev W. Bronk	A. J. Carlson
E. B. Fred	Mervin J. Kelly
Walter S. Hunter	John E. Pfeiffer
Paul E. Klopsteg	Ralph A. Rohweder
Kirtley F. Mather	E. C. Stakman
Howard A. Meyerhoff	Marshall H. Stone
Fernandus Payne	Alan T. Waterman
Paul B. Sears	
Warren Weaver	

Arden House, September 15, 1951

It might perhaps profitably be said that the members of the Arden House Conference did not intend that this statement be viewed as a polite rephrasing which suggests only minor changes. This statement calls for four main things:

1. A real strengthening of the direct usefulness of the AAAS to scientists and to scientific societies.
2. A shift in emphasis from the more detailed aspects of the various technical branches of science to the broader problems of science as a whole.
3. The cultivation of synthesizing and unifying activities as the main emphasis of the AAAS in its internal work within the body of science.
4. The undertaking of attempts to improve public understanding of science as the main external emphasis of the AAAS.

Warren Weaver

For the Executive Committee
American Association for the Advancement of Science

News and Notes

The University of Minnesota Meeting of Biological Societies

THE American Institute of Biological Societies sponsored its second fall campus meeting for biologists Sept. 9–12 at the University of Minnesota. President Morrill described the meeting as the largest gathering of scientists ever assembled at that university. Total attendance, including wives and guests, was approximately 1,500, which exceeded preconvention estimates. On-campus dormitory and eating facilities were adequate to take care of even this large number, and conference and meeting rooms in campus buildings were only a short distance from the dormitories. The Coffman Memorial Union, one of the best-equipped buildings of its kind in the country, provided space for the Biological Sciences Exhibit Hall, headquarters of various societies, including AIBS, and the locale for the Biologists' Smoker.

Eleven biological societies took part in the meeting: the American Society for Horticultural Science, the American Society for Human Genetics, the American Society of Plant Physiologists, the American Bryological Society, the American Society of Naturalists, the American Society of Plant Taxonomists, the Botanical Society of America, the Ecological Society of America, the Genetics Society of America, the Mycological Society of America, and the Society for Industrial Microbiology.

Prior to the meeting, the Ecological Society had a three-day field program at the university's Biological Station at Itasca State Park, in northern Minnesota. Also before the meeting, the American Society of Bryologists had a field trip starting from Duluth and taking in the north shore of Lake Superior. During the meeting, numerous tours and demonstrations were arranged for society members and their wives, including visits to the Green Giant Company at LeSueur, Northrop King and Company, and General Mills.

The meeting began on Sunday, Sept. 9, with various council and executive board conferences, and with the opening of the Biological Sciences Exhibit Hall. All available space in the main ballroom was occupied by the 25 booths provided exhibitors, including publishers, biological supply houses, and instrument concerns interested in the biological sciences.

During the ensuing three days each society held sessions at which scientific papers were read and also participated in a number of joint symposia where subject interests crossed society lines. One of the advantages of a meeting of biological societies such as this is the opportunity it provides for allied biological fields to share their advances in knowledge. Of the 589 papers presented at the sessions, 263 were in programs arranged by the Botanical Society of America, 149 by the American Society for Horticultural Science, 81 by the Genetics Society of America, and 61 by the Ecological Society of America.

The symposia and forum discussions on broad aspects of biological science were an important part of the meetings. The American Society for Horticultural Science held a joint symposium with the National Committee on Fertilizer Application, which included such timely topics as "Future of Leaf Analysis as a Diagnostic Tool for Determination of Fertilizer Requirement of Fruit Crops" and "Use of Fertilizer Solutions in Leaf Feeding." It joined with the American Society of Plant Physiologists in a symposium on "Why Plants Grow Where They Do." Another interesting symposium of the horticulturists was "Investigations in Polyploidy of Fruits."

The American Society of Human Genetics presented a symposium on "Human Genetics and Human Welfare." The presidential address, delivered by Lee R. Dice (University of Michigan), dealt with "Heredity Clinics: Their Value for Public Service and for Research." An open house at the Dight Institute added to the interest of the sessions.

The American Society of Naturalists included in its program a symposium on "Patterns of Cellular Organization." The presidential address, by Paul C. Mangelsdorf (Harvard), had as its subject "Evolution under Domestication."

The American Society of Plant Physiologists arranged most of its program jointly with the Physiological Section of the Botanical Society. In addition, a symposium on "Organic Acid Metabolism in Higher Plants" was presented. At the annual banquet, K. V. Thimann gave the address of the retiring president, and Birgit Vennesland gave the Stephen Hales Lecture.

The Botanical Society, as usual, had its sessions organized in various sections. Some of these included symposia of general interest, including "Vegetation of the Upper Great Lakes Region" in the systematic section, "Experimental Work on Teaching of Botany" and "Sequence of Subject Matter in General Botany" in the teaching section, and "Phylogeny and the Fern-Pteridosperm Complex" in the paleobotanical section. At the Botanical Society banquet—a palatable blend of science, art, and humor—Dr. Blakeslee, of Smith College, former president of the AAAS, gave the address.

The Ecological Society's program at Lake Itasca included a terrestrial ecology trip (The Maple–Basswood–Prairie Ecotone, Mary's Lake Deer Enclosures, and Twin Lakes Bog Succession) and an aquatic ecology trip. The campus meeting included, in addition to the usual paper-reading sessions, symposia on "The Definition, Evolution, and Significance of Ecological Niches for Animals" and "The Application of Ecological Knowledge to Water Conservation." Joint sessions with the Grassland Research Foundation included a symposium on "Ecology of Grassland Utilization in Central United States," and there was also a joint meeting with The Nature Conservancy. At the

annual banquet, Past President E. Lucy Braun gave the address on "Our Eastern Forests—in Kodachrome."

The Genetics Society had a program almost entirely of contributed papers; in addition, this society had a joint symposium with the naturalists on "Patterns of Cellular Organization." The Mycological Society held several joint sessions with the microbiological section of the Botanical Society, and jointly with the Society for Industrial Microbiology there was presented the annual lecture of the Mycological Society on "Molds, Mutants, and Monographers," by Charles Thom, of Port Jefferson, N. Y.

On Monday evening the American Institute of Biological Sciences arranged a meeting for members of all the participating societies. Following a short address of welcome by President Morrill, the keynote speech of the evening was given by Alan T. Waterman, director of the National Science Foundation. His topic, "Federal Support of Fundamental Research in the Biological Sciences," appears in its entirety in the October issue of the *AIBS Bulletin*. The Institute also sponsored a symposium on "The Economics of Journal Publication," with A. J. Riker, of the University of Wisconsin, chairman of the AIBS Publications Committee, presiding. Representative journal editors, as well as representatives from different types of printing establishments, took part in the discussion. On the last evening, AIBS gave the participants an opportunity to relax at the Biologists' Smoker.

The meeting last year at Ohio State University was the first large-scale campus meeting of biological societies; even though it was an initial attempt, it proved so satisfactory that the same group expressed a desire for another fall campus meeting under AIBS sponsorship this year. The University of Minnesota generously offered its facilities for the purpose and cooperated so effectively that this year's meeting was most satisfactory from every viewpoint. At the request of many of the AIBS societies, a 1952 fall meeting is planned, with Cornell University as host, and a 1953 fall meeting, with the University of Wisconsin as host. Biologists should appreciate this willingness of university administrations to invite them to their campuses, since it is no simple matter to provide adequate accommodations for so many visitors for a three-day period.

With the duality of meeting sites and times of year now provided by both AAAS and AIBS, the biological societies have an unusual opportunity to plan ahead for the type of meeting best suited to their needs, or to utilize the opportunity to offer sessions for members in different sections of the country.

CLARENCE J. HYLANDER
Executive Secretary, AIBS

Scientists in the News

Allen V. Astin has been appointed acting director of the National Bureau of Standards. Dr. Astin has been with the bureau since 1932. Recently he has been an associate director in charge of the Divisions of Electricity, Electronics, Ordnance Development, Missile Development, and the Office of Basic Instrumentation.

Robert M. Burns, chemical director of the Bell Telephone Laboratories, will receive the Perkin Medal, outstanding honor conferred for achievement in American industrial chemistry. The Jury of Award consists of representatives of the American Chemical Society, the American Institute of Chemical Engineers, the Electrochemical Society, and the American Section of the Société de Chimie Industrielle, in addition to officers of the American Section of the Society of Chemical Industry, under whose auspices the medal is awarded. The formal award of the medal to Dr. Burns is scheduled for Jan. 4. The Perkin Medal was founded in 1906 in honor of William Perkin, who that year celebrated the fiftieth anniversary of his discovery of the first synthetic dye, and who received the first impression of the medal in honor of the event. The medal is awarded annually to "a member of the chemical profession residing in the United States for outstanding work in applied chemistry."

A. Buzzati-Traverso, professor of genetics at the University of Pavia, Italy, has been appointed visiting professor of genetics for the fall semester at the Department of Zoology of the University of California, Berkeley.

At the University of Texas Medical Branch, Galveston, **Victor C. Calma** has accepted appointment as assistant professor of physiology, and **Edward G. Rennels** has been appointed assistant professor of anatomy. **Kenneth Franklin,** professor of physiology at the University of London, will be guest lecturer in physiology during the week of Nov. 12. Dr. Franklin is visiting professor of physiology at the University of Illinois, Urbana.

Frederick C. Chang, former chairman of the Department of Chemistry at Lingnam University, Canton, has joined the staff of the University of Tennessee Medical Units as lecturer in chemistry and research associate in pathology. Before he went to China in 1946, Dr. Chang was a research associate at Harvard.

The North Dakota Cancer Society has awarded a grant-in-aid of $27,400 to **W. E. Cornatzer,** professor and head of the Department of Biochemistry, University of North Dakota Medical School, to establish a radioactive isotope laboratory for the treatment of cancer and to study the metabolism in experimental cancer with isotopes.

Palmer M. Craig is now vice president—engineering of the Television and Radio Division of the Philco Corporation. Mr. Craig joined Philco in 1933 as a senior radio receiver engineer. He served as chief engineer in charge of radar and military radio develop-

ment during World War II and was named chief engineer of the company's radio division in 1943.

Bruce Dickerson, of the Engineering Department of Hercules Powder Company, has been awarded the 1951 Industrial Wastes Medal sponsored by the Federation of Sewage and Industrial Wastes Association. Mr. Dickerson earned the award for his article, "High-Rate Trickling Filter Operation on Formaldehyde Wastes," which appeared last April in *Sewage and Industrial Wastes.*

The Fourteenth Annual Louis Gross Memorial Lecture was delivered at the Jewish General Hospital, in Montreal, under the auspices of the Montreal Clinical Society, by **Myron Prinzmetal,** associate professor of medicine, UCLA, on the subject "The Auricular Arrhythmias."

Frank H. Spedding, director of the Institute for Atomic Research at Iowa State College, has been awarded the 1952 William H. Nichols Medal of the American Chemical Society's New York Section. Dr. Spedding was cited for his "outstanding contributions in the constitution, properties and chemistry of the rare earth and actinide elements."

Thomas A. Spragens has been elected secretary-treasurer of The Fund for the Advancement of Education, and **John K. Weiss** has been named assistant vice president. Mr. Spragens served from 1946 to 1951 as assistant to the president of Stanford University. Mr. Weiss has been secretary to the Board of Trustees of State University of New York for the past two and one-half years.

Allen J. Sprow, assistant editor, *Psychological Abstracts,* has been appointed to the additional post of Education, Philosophy, and Psychology Librarian at the University of Illinois.

L. K. Stringham has been appointed chief engineer for The Lincoln Electric Company of Cleveland. Mr. Stringham, an electrical engineer, has been with Lincoln since 1933, working continuously in the engineering department.

Vittorio Tonolli is the new director of the Istituto Italiano di Idrobiologia at Pallanza, Lago Maggiore, Italy, succeeding the late **Edgardo Baldi.**

Paul A. Van Pernis has been appointed pathologist and director of laboratories at Swedish American Hospital, Rockford, Ill., and clinical instructor in pathology at the University of Illinois College of Medicine.

The Institute of International Education has named **John D. Wilson** a vice president. A former member of the Harvard economics department, Mr. Wilson has been with the New York Life Insurance Company. The institute is a private agency in the field of international exchange of persons under the sponsorship of the U. S. government, foreign governments, colleges and universities, and private organizations here and abroad.

Education

The **American University of Beirut,** Lebanon, will hold its second Middle East Medical Symposium Nov. 9–11. Ten countries will be represented, and the attendance is expected to reach 600. Approximately 25 outstanding medical men, whose expenses will be paid by their own organizations, will speak on infectious diseases, preventive medicine, and public health. The annual symposium was organized by Neal J. Conan, Jr., a New York physician who is chief of internal medicine at American University.

Brandeis University Institute of Adult Education will present a series of six Thursday evening lectures in its "Frontiers in Science" course, which began on Oct. 25 with a lecture by Robert A. Thornton on "The Nature and Functioning of Science." On Nov. 1, Rene J. Dubos spoke on "Disease and Society;" Hugh S. Taylor will discuss "Chemistry and Human Resources" on Nov. 15; Harlow Shapley, "Elements of Cosmogony" on Nov. 29; and Kirtley F. Mather, AAAS president, will try to predict "The Future of Man as an Inhabitant of the Earth" on Dec. 6.

At **Bryn Mawr** the James Llewellyn Crenshaw Memorial Lectures on "Sources of Energy" are being given by Farrington Daniels (Oct. 29); Cornelis B. van Niel (Nov. 5); Henry D. Smyth (Nov. 12); and M. King Hubbert (Nov. 19). The lectures are part of a program of the Committee on Coordination of the Sciences, made possible by a gift of the Carnegie Corporation of New York.

Drexel Institute of Technology celebrated its sixtieth anniversary Oct. 30–Nov. 1 with a program that included 14 panel discussions of subjects ranging from banking through metals, oil, and transportation, to the place of women in industry. Psychology, human resourcefulness as the dominating element for the petroleum industry, machinery and equipment, and chemistry were other subjects discussed by more than 50 distinguished panel participants.

Duke University School of Medicine has enrolled 13 physicians in a five-month course in the medical aspects of nuclear energy, sponsored by the Atomic Energy Commission. Nine doctors are from the armed forces, three are attending under AEC postdoctorate fellowships, and one is from the U. S. Public Health Service.

Graduate fellowships awarded at **Lehigh University** will amount to more than $20,000 and will go to 24 students, including five from foreign countries. The highest award, the Linde Air Products Company fellowship, went to Glenn W. Olyer (Fayetteville) for continuation of his studies in metallurgy. Dogan E. Gucer (Istanbul) is the recipient of the William C. Gotshall scholarship in metallurgy, and Erwin H. Bareiss (Thayngen-Schaffhausen, Switzerland), of the C. Kemble Baldwin fellowship for work in applied mathematics; Sheng Tai Shih (Wuchang, China) and Claude E. Hellman (Moselle, France) received funds for work in metallurgy under Roy R. Hornor grants.

Grants and Fellowships

American Cyanamid Company has established a two-year graduate fellowship at the Institute of Textile Technology, Charlottesville, Va., for a course of studies in textile chemistry. Richard P. Barber, of Taunton, Mass., a graduate of Bradford Durfee Technical Institute, has been selected as the first fellow. During the 1952 summer vacation he will work at one of the member textile mills associated with the institute.

The **American Society for the Study of Sterility** will award a prize of $1,000 for the best essay on the subject of infertility and sterility. The winning contribution will be part of the program of the 1952 meeting of the society. For full particulars, address the society at 20 Magnolia Terrace, Springfield, Mass.

Engineering student winners in the first national scholarship contest sponsored by the **American Society of Tool Engineers** are John Wayne Boring, University of Kentucky; James A. Richman, State University of Iowa; William H. Garlock, University of Kansas; and William P. Ryan, Villanova. The ASTE plans to present similar awards annually.

Through a gift to the Society for the Psychological Study of Social Issues by the Harwood Manufacturing Corporation, an **Industrial Relations Research Award** will be presented at the September 1952 meeting of the American Psychological Association to the individual whose research is judged most meritorious as a scientific contribution to the understanding of labor-management relations. Address inquiries to Helen S. Service, SPSSI, Department of Psychology, Columbia University.

Northwestern University will receive approximately a million dollars from the estate of Herman L. Kretschmer, Chicago urologist who died Sept. 23. The money is to be used to establish the **Lucy and Edwin Kretschmer Fund** for special studies and investigations in the field of urology in the Medical School.

National Institute of Mental Health has allocated $506,042 to the continued support of 38 investigations now in progress and $276,719 to 20 new research projects. Three of the new grants will support studies of mental health related to industrial living. Marie Jahoda, of the New York University Research Center for Human Relations, Reuben Hill, of the University of North Carolina, and Arthur Kornhauser, of Wayne University, will conduct this research. The largest amount ($45,915) went to Robert R. Sears, of Harvard, for an investigation of child rearing in relation to personality development. Edith B. Jackson, of Yale, received $37,047 for a continuation of the rooming-in project.

The University of Nottingham invites applications for appointment in 1952 to a **Research Fellowship** established by the Nottinghamshire Council of the British Empire Cancer Campaign. The fellowship will be tenable for not less than three years, and the salary will range from £900 to £1,000 with reasonable technical and other assistance. Address Registrar, University Park, Nottingham, Eng.

The first recipient of the **Mrs. John S. Sheppard Foundation** fellowship is John Malcolm Smith, instructor in government at Columbia. Dr. Smith will study the place of temperance in education in a state system of liquor control.

Miscellaneous

The **Bureau of Plant Industry,** Beltsville, Md., celebrated its golden jubilee Oct. 24–26 with a series of talks by leading plant scientists. David Fairchild, C. S. Schofield, C. L. Shear, T. H. Kearney, W. T. Swingle, W. R. Beattie, Carlton R. Ball, and Percy Ricker, retired employees of the bureau, were honored at a dinner during the closing session.

Calling themselves the **Guinea Pig Club,** representatives from each medical school in Chicago and from hospital and research institutions met on Sept. 13, the 100th anniversary of the birth of Walter Reed, to form an organization in which membership will be limited to medical scientists, students, and technicians who have served in any way as human test material for medical research. At the meeting of the first chapter, a committee composed of Anton J. Carlson, chairman, Max Sadove, Andrew C. Ivy, Andrew H. Ryan, W. W. Baur, and John Sembower was appointed to organize the club on a national basis. Activities of the group will include meetings at which papers will be presented, the presentation of some form of honorary recognition for outstanding volunteer service, and the publicizing of the codified rules now in effect for the conduct of experimental procedures on human beings. The formal name "Walter Reed Volunteers" was decided upon at the meeting. Suggestions and comments will be welcomed and should be addressed in care of the National Society for Medical Research, 185 N. Wabash Ave., Chicago 1, Ill.

Charles N. Frey, Scarsdale, N. Y., was elected president of the Institute of Food Technologists at the annual meeting held in New York last summer.

New journals recently received here include the ***Journal of the Institute of Polytechnics,*** Osaka City University, Vol. 1, No. 2 (Oct. 1950); and ***Optica Acta,*** sponsored by the International Commission of Optics, Acting editor of the last-named is A. Maréchal, and all articles are in either English or French. Stanley S. Ballard, Tufts College, Medford 55, Mass., will supply further information. Vol. 1, No. 2, of the ***Pakistan Journal of Forestry*** (April 1951), and Vol. 1, No. 1, of the ***Pakistan Journal of Health*** (April 1951) have also been received. The Royal Australian Chemical Institute has begun publication of a new quarterly, ***Reviews of Pure and Applied Chemistry*** (Vol. 1, No. 1, March 1951), which replaces its earlier ***Journal and Proceedings.*** The ***American Fertilizer,*** trade publication, has been renamed ***American Fertilizer and Allied Chemicals,*** and technical experts in insecticides have been added to the staff.

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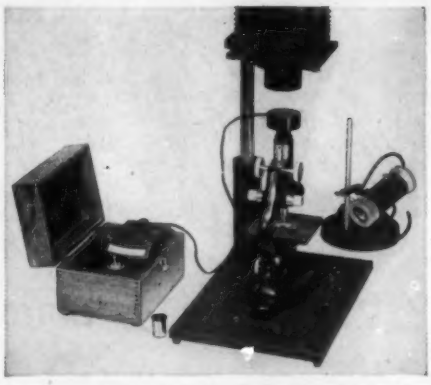

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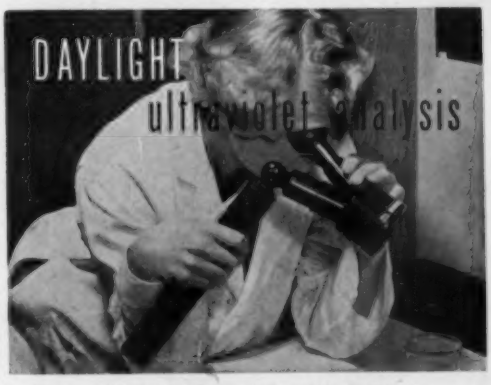

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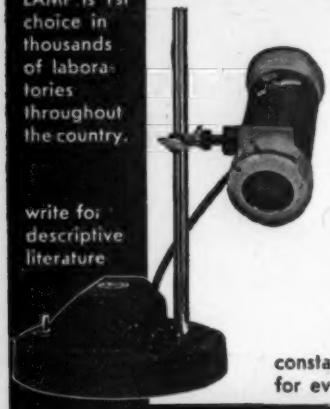

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Nov. 7–9. Industrial Research Institute. Cincinnati.

Nov. 8–9. National Conference on Industrial Hydraulics. Sherman Hotel, Chicago.

Nov. 8–10. Conference on the Education of Teachers in Science. Ball State Teachers College, Muncie, Ind.

Nov. 8–10. Geological Society of America. Detroit.

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Nov. 8–10. Seminar on Operations Research in Industry and Business. Case Institute of Technology, Cleveland.

Nov. 9–10. Tennessee Academy of Science (Fall). Austin Peay State College, Clarksville.

Nov. 9–11. National Educational Conference on Role of Women at Mid-Century. Stephens College, Columbia, Mo.

Nov. 12–14. National Fertilizer Association (Fall). Atlanta Biltmore Hotel, Atlanta.

Nov. 12–15. Association of Land-Grant Colleges and Universities. Rice Hotel, Houston, Texas.

Nov. 12–15. National Electrical Manufacturers Association. Chalfonte-Haddon Hall, Atlantic City.

Nov. 12–16. Gulf and Caribbean Fisheries Institute. Sans Souci Hotel, Miami Beach.

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Nov. 15. American Society for Engineering Education (Fall). Rice Hotel, Houston, Texas.

Nov. 15–16. American Council of Commercial Laboratories. Baker Hotel, Dallas, Texas.

Nov. 15–17. American Anthropological Association (Annual). Palmer House, Chicago.

Nov. 15–17. Rocky Mountain Oil and Gas Association (Annual). Cosmopolitan Hotel, Denver.

Nov. 19–20. Society of Exploration Geophysicists, Midwest regional (Annual). Baker Hotel, Dallas.

Nov. 22–24. Central Association of Science and Mathematics Teachers (Annual). Hollenden Hotel, Cleveland.

Nov. 25–Dec. 1. Congrès International de Chimie Industrielle. Paris.

Nov. 26–30. American Society of Mechanical Engineers (Annual). Chalfonte-Haddon Hall, Atlantic City.

Nov. 26–Dec. 1. Exposition of Chemical Industries. Grand Central Palace, New York.

Nov. 27–28. American Institute of Architects and Atomic Energy Commission Conference on Laboratory Design for Handling Radioactive Materials. National Academy of Sciences, Washington.

Nov. 28–30. Scientific Apparatus Makers Association (Midyear). Hotel New Yorker, New York.

Nov. 28–30. Western Forestry and Conservation Association (Annual). Multnomah Hotel, Portland, Ore.

Nov. 29–30. Animal Care Panel. Northwestern University, Chicago.

Nov. 29–30. Pittsburgh Diffraction Conference (Annual). Mellon Institute, Pittsburgh.

Nov. 30. Scientific Research Society of America (RESA). National Academy of Sciences, Washington, D. C.

Nov. 30–Dec. 1. American Physical Society. Rice Institute, Houston.

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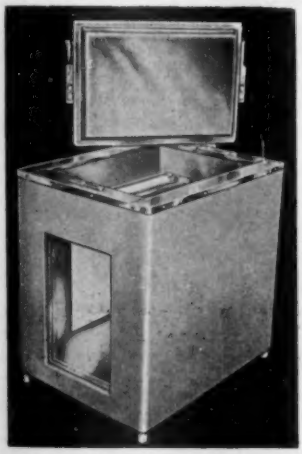

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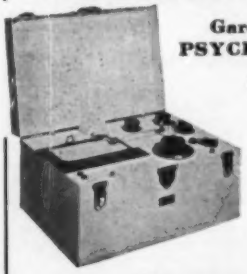

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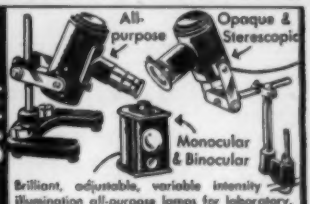

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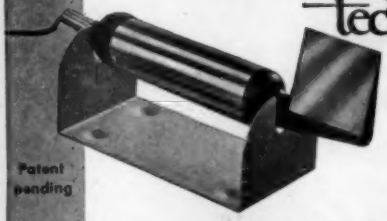

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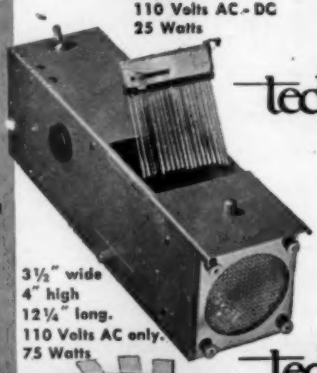

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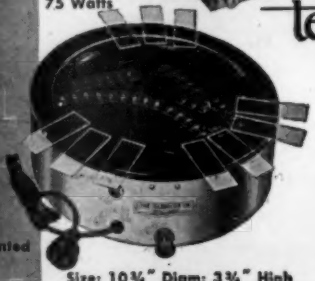

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